Pressing Issues:

A Venetian Socioeconomic Overview

An Interactive Qualifying Project Report submitted to the Faculty of
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Each team member contributed equally towards the completion of this project. Without the full participation of each member and extensive teamwork the following project would not have been successful.

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Abstract

This project discusses and assesses the current condition of tourism, retail, and cargo delivery as well as the social and economic implications of each in Venice, Italy. The 14.6 million yearly tourists have been the main supporters of Venetian retail in the last decades creating an immense demand for tourist related shops such as high fashion clothes or souvenir shops. Defects in the current cargo delivery system have made the delivery of goods to retail stores more costly which is a contributing factor to price inflation. Through analysis of official *Comune di Venezia* data, interviews with important people, and personal observation, our team was able to gain insight on these issues, conduct an assessment of these three activities, as well as make suggestions for more efficient documentation and planning. One would think that the positive effects of tourism on retail would also be the same for cargo delivery, however our team has found that tourism does not necessarily stimulate cargo deliveries. The reason being that most of the daily cargo is delivered to food stores rather than non-food tourist related shops which require fewer deliveries. Each of these three activities has its economic benefits and detriments as well as social implications. Understanding how tourism, retail, and cargo delivery relate and rely on each other is vital for a better socioeconomic planning to keep Venice afloat.

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1. Executive Summary

This project is the product of an overall assessment of the Venetian socioeconomic panorama. It shows the interrelationship of Venice's three main socioeconomic activities: tourism, retail and cargo delivery, by analyzing their dependency and effects on each other. Our project assesses all the benefits, detriments and social implications of the 15 million tourists[1] that visit Venice yearly, and the effect of their influx upon the city. Our project establishes this inflow of tourists as the main proponent of Venetian retail but also a strong contributor to price inflation. The report also analyzes the effects of residential decline and the arrival of supermarket chains on the traditional retail food sector. To supply the demand of goods required by the retail stores Venice relies on a water-based cargo system. Our team assessed the inefficiencies of the current cargo delivery system; reviewed proposals made by prior IQP groups, and proposed new solutions to create an improved delivery system. One significant finding that emerged from our assessments yielded results counterintuitive to previous hypotheses. We found that tourism stimulates retail but does not directly stimulate cargo delivery as severely as had been expected. We believe this is due to the fact that goods delivered to tourist-targeted shops consist of clothing or souvenirs. These shops only receive deliveries a few times a month or year, unlike food stores or restaurants which have daily deliveries. Other findings emphasize the need of improved regulation and planning for tourism and retail. Proposals and suggestions are mentioned pertaining to each individual issue.

Our project was limited by the boundaries of Venice's *Centro Storico*. The *Centro Storico* is small in size and geographically isolated. These factors facilitate the study of how broad socioeconomic issues impact a unique city. In order to successfully complete an assessment of Venetian socioeconomics our team analyzed data from a wide range of sources. Our primary dataset for tourism analyses came from *Turismo a Venezia 2005*; a book published by the *Comune di Venezia* which contains the most recent and complete data and statistics collected by Venice's office of statistics and research. Using official retail data from The Venetian Chamber of Commerce our team conducted an analysis of the retail sector. We used the previously collected data to parallel and evaluate the effect of supermarkets on traditional stores as well as investigate patterns in store openings. With that information we were able to conduct a number of sound and distinct analyses based on informed assumptions. This database however, had some deficits that impeded the team from making a complete analysis of the evolution of all retail stores. The main problem with the database is that it does not include store closure dates. The only instance in which one can find that a store is closed is if another store replaced it at that exact address. Yet even with this information there are still limitations in the fact that one is not able to determine the time of closure. The database was found to be either too specific or to general, and made distinct categorization difficult for the group. Those categorizations that were not overly broad were overly specific and included a small fraction of stores.

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[1] Federica Durigan Dr.ssa and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005* (Milano: Libri Scheiwiller, 2005).

To assess the current implementation of proposals made by past IQP cargo groups our team interviewed a number of individuals involved with the cargo delivery system. The team thoroughly reviewed all past IQP's related to cargo and observed the different phases of the delivery process in order to assess the problems of the current system. We also discussed logistics and possible future implementations with a group of people from the Santa Fe Institute who are developing a traffic model for the city of Venice. This group gave us an insight into some more efficient models of cargo distribution using an autonomous agent modeling system that helped us make some proposals for improvements. Our group also set out to illustrate our analyses and findings through the use of many visual graphics.

Tourism offers many benefits to the Venetian economy, generating 70% of Venetian income with over €1 billion[2] a year and 50% of all jobs[3]. However, it also has some negative effects. Tourism is a main contributor to price inflation and high cost of living in Venice. Our team has found that real estate and apartment rental prices in Venice are unreasonably expensive. The average apartment listings have rents which are about three times higher than the average affordable rent for a Venetian family. This can be explained by the fact that 20% of all Venice housing[4] is owned by non-residents, which one can assume are tourists. The extra demand for housing created by tourists combined with the limited supply of housing yields increased housing prices. Other negative effects include tourist generated expenses such as those from repairs and maintenance due to wear and tear on the city and increased waste production. Our group has found that every year tourists generate more than €250 million in expenses for the city of Venice[5].

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[2] ibid.

[3] "Venice Business Profile," Columbus Travel Publishing Ltd., http://guides.hotelbook.com/sisp/hotelbook/index.htm?fx=location&loc_id=135295&sub_section=Business (accessed 10/20, 2007).

[4] Jonathan Martin and others, *Assessment of the Non-Resident Housing Market in Venice, Italy* (Venice, Italy: Worcester Polytechnic Institute,[2001]).

[5] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

After analyzing the tourism data contained in the *Turismo a Venezia* 2005 packet and past IQP's, the team was able to graphically represent our most impacting findings. We were able to construct a graphic illustrating the inflow of tourism into the city of Venice on an average day during high season. It includes all tourist entry points, the number of tourists coming in through each entry point, as well as the percentage of residential and excursionist tourists coming in through each.

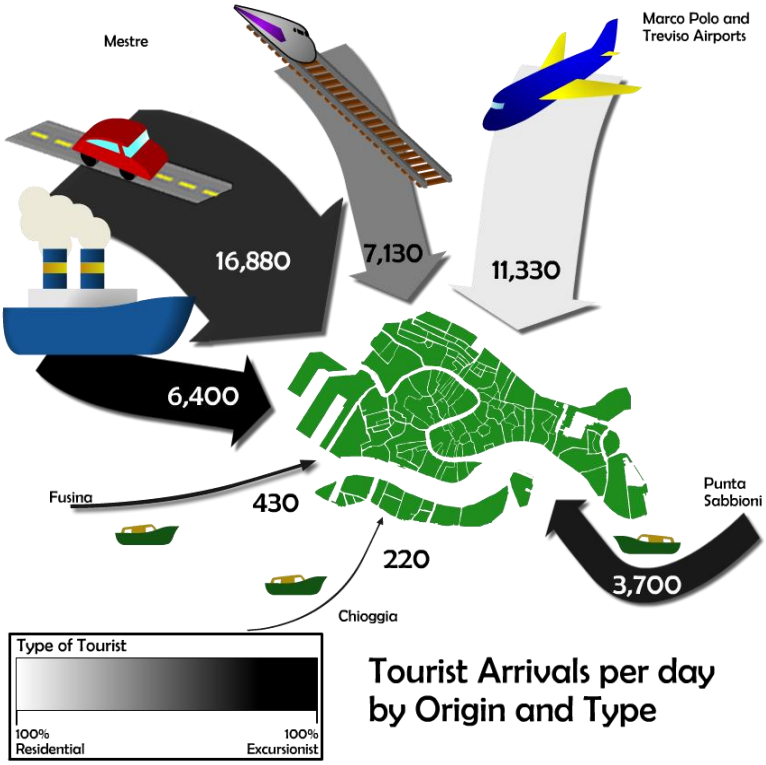

Figure 1: Inflow of tourism into the city of Venice on an average day during high season

A second graphic that resulted from our analysis illustrates the inflow of the 46,000 tourists, 47,000 commuting workers and 20,000 students entering Venice for a day during high season. This graphic serves to make the point that on any given day Venetian residents are outnumbered 2 to 1; 113,000 non-residents to 62,000 residents[6].

[6] Sandro Lombardo and others, *Comune Di Venezia: Servizio Statistica e Ricerca: Una Stima Della Populazione Presente Nel Comune Di Venezia Anno 2004* (Venice, Italy: Direzione Centrale Programmazione e Controllo Servizio Statistica e Ricerca,[2006]).

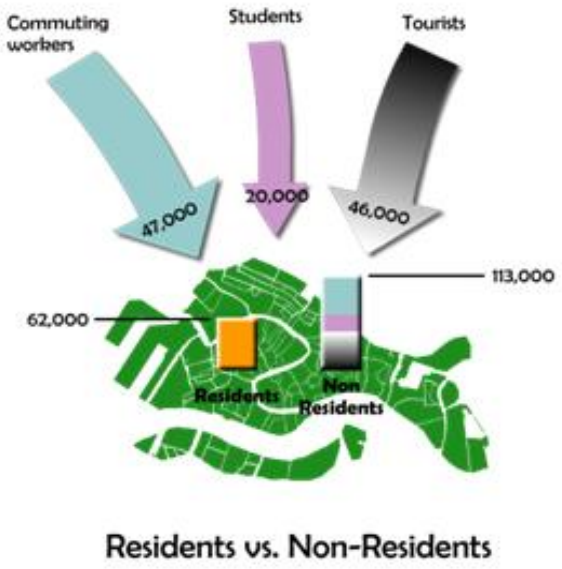

Figure 2: Relationship of residents to non-residents on a typical day

The disproportion of non-residents to residents in Venice becomes a problem for residential comfort level, which is one of the contributing factors to residential decline. Since 1970 Venice's population has decreased by 50%[7]. In combination with residential decline and the arrival of supermarkets, the traditional retail food stores have been greatly hindered. There has been a 23% decrease in traditional food store openings in the last 40 years. A small analysis conducted by our team of 25 food stores in *Cannaregio* shows that with the arrival of 4 supermarkets, all 25 food stores closed; 60% of them being replaced by other food stores and 40% being replaced by non food stores. This shows that with the increase in demand of tourist related shops, food stores' business has been greatly hindered. However, tourism is indeed stimulating the non-food retail stores. Another analysis conducted by our team shows that San Marco, the *sestiere* with the highest tourist traffic, also contains the highest numbers of non-food stores, with daily tourist traffic of about 17,000[8] and 870 retail stores.

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[7] Citta di Venezia, "Area Dei Servizi Statistici Ed Ecografici," http://www2.comune.venezia.it/statistica/Mappa_Sito/indice_sito.asp (accessed December 10, 2007).

[8] Marianne Schady and others, *An Assessment of the State of Tourism in Venice -- a Quantitative Estimate and Characterization of Excursionist Tourists.*,[2000]).

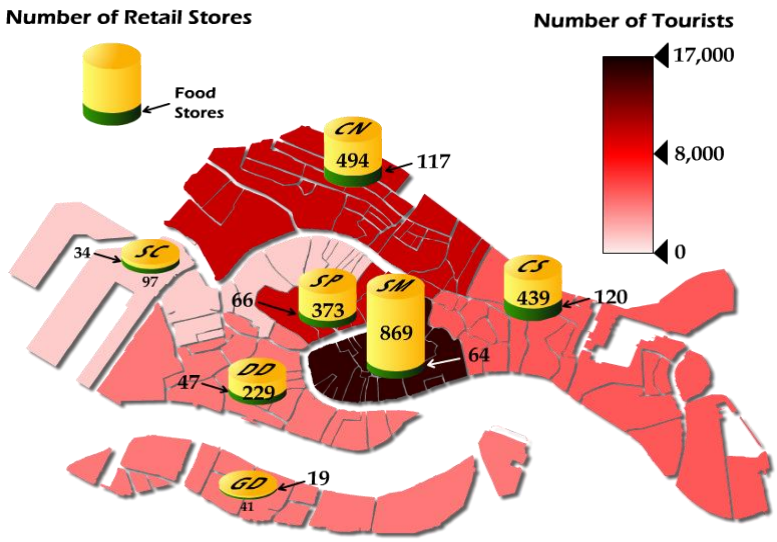

Figure 3: Demand of retail stores in relation to the number of tourists that frequent each *sestiere*

One would think that the immense demand for retail stores created by tourism would also create a direct demand for cargo but conversely our team found that this is not necessarily true. The reason is that tourist-targeted retail stores such as clothes and souvenir shops do not require daily deliveries. The stores that do require regular deliveries are the food stores. Therefore, some of the negative impacts of tourism on food stores could ultimately carry over to the cargo delivery system.

Increasing efficiency of the cargo delivery system would not only lead to potential economic benefits for both the boat drivers and the city, but could also lead to a reduction in traffic and the *moto ondoso* effect. For this reason, our team decided that it would be important to highlight past IQP proposals for a more efficient delivery system as well as make new suggestions for further improvements. The team obtained an update on the status of the cargo delivery warehouse being built by the city on the island of Tronchetto. The warehouse will serve as a storage and sorting facility for the city's cargo and is a starting point for the implementation of a more efficient delivery system. Our group found that the city will not be intervening or enforcing a change in the current cargo delivery system but rather, it will be up to the boat drivers to implement a new system if they desire. After consulting with a group of people from the Santa Fe Institute (a group who uses autonomous-agent models to develop business solutions), our group proposed a more advantageous cargo system. We believe the most beneficial system would consist of reconfigurable delivery routes, which would change daily according to the demand of Venice's 125 islands.

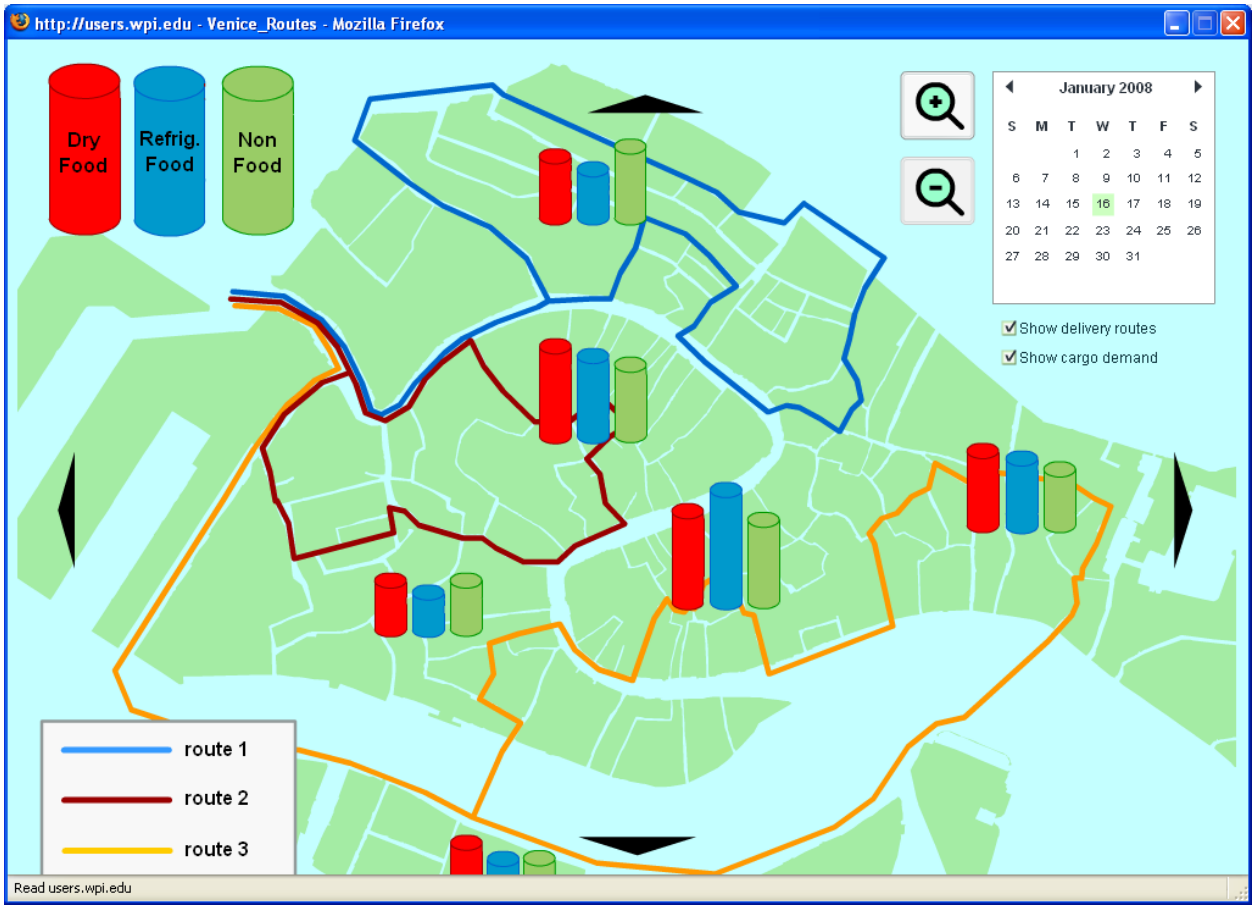

Figure 4: Potential application for reconfigurable routes based on delivery demand

Up to this point, many projects that dealt with Venetian socioeconomic issues had been completed. However, some of these subjects are so intertwined, that they cannot be analyzed separately: Venetian tourism, besides driving the economy, largely affects the quality of life of the population and the evolution of the retail sector. The retail sector, in turn, generates the demand for the cargo transportation system, which causes many urban and societal issues. By contributing to the sequence of socioeconomic studies with an integrated assessment of Venice's three main socioeconomic issues, our team hopes that future IQP groups will continue to build off of our research and proposals. We also hope that the proper authorities will implement measures for better urban planning and development in order to promote healthier social and economic activities in the city.

2. Introduction

In a world driven by globalization and industrialization, societal issues are often independent of location. A common expression in Italy is, "Tutto il mondo è paese". This literally translated, means "the entire world is a country." A rough translation however is "wherever you go, in the world, you will find the same problems, people, and issues." Tourism, retail, and cargo transportation are just three of these issues, which are part of a broad category known as socio-economics - the interrelationship between social behavior and the system pertaining to material wealth. Each one of these socioeconomic issues can be considered a result of global demand. Throughout the process of supplying global market demands, issues often arise concerning the efficiency or sustainability of each sector. However in many cases issues are not addressed in the early stages of their evolution, and many problems arise. It would be advantageous to create a system to analyses these situations before they become uncontrollable.

Italy is a country of high consumption where the tourism, retail, and cargo transportation industries have thrived. In the city of Venice there has been a very high demand in each of these three sectors. Tourism has been the main engine that powers the other economic sectors in Venice since the baby boom of the 1960s. The approximately 15 million tourists that visit Venice every year[9] have created an immense demand for both goods and services. These goods and services are mainly supplied by a cargo system delivering over 250,000 tons of cargo every day[10]. This cargo is delivered to restaurants, shops, supermarkets, and retail stores all over Venice, so tourists can eat and shop and residents can obtain daily needs. Tourism allows for an overall demand while retail supplies it and cargo in turn supplies retail.

Although on the surface, it may seem as if tourism brings in many economic benefits to the city of Venice, there is also a darker side of tourism that must be properly analyzed and addressed. As tourism has grown, the comfort level and population of Venetian residents has declined[11]. Within the last fifty years, it has become increasingly difficult for residents to obtain their daily needs and the population of Venice has decreased by more than fifty percent to a shocking 62,000 people[12]. At this rate if this situation is not addressed and precautionary measures are not taken, the city of Venice, which is the second most popular tourist destination in all of Italy, is in danger of losing the very people that inhabit and run the city within the next thirty years.

In order to plan for better tourist regulation and urban and infrastructural management in Venice, it becomes necessary to obtain tourism statistics and information such as daily and overnight tourist counts, ratios, and demographic information. This need for improved urban and infrastructural management and planning has also led to the improvement of systems vital to the city's socioeconomic conditions, an example being the possible future re-engineering of the cargo transportation system. A

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[9] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

[10] Amanda Lynn Tucker and others, *Re-Engineering the City of Venice's Cargo System for the Consorzio Trasportatori Veneziani Riuniti.*,[2001]).

[11] Ta Karra Greene and others, *Residential Comfort Level: An Analysis of the Venetian Retail Sector*,[2005]).

[12] Citta di Venezia, *Area Dei Servizi Statistici Ed Ecografici*

newly designed system if implemented, could seriously impact Venice's society, economy and environment by reducing the *moto ondoso* effect and decreasing cargo traffic by a significant amount. Unfortunately however, the outlook of the retail sector does not look as bright. Recent data has indicated a decline in the retail sector, specifically the retail food shops from which the residents buy. This decline can be partially blamed on the rising prices in Venice, the establishment of supermarkets, and those stores replacement by tourist related stores.

There has been some investigation of Venetian tourism, but at the start of this project there was still much to be discovered and many questions left unanswered. Topics such as the future of Venetian tourism and the interrelationship it shares with retail and cargo had yet to be extensively researched and discussed. With respect to the cargo transportation system, there was still a large informational gap concerning the introduction of a new warehouse and system to the island. Investigations needed to be conducted in the overall status of the system as well as the effects of politics on the system. It was also necessary to discover if there are any actual plans for optimization of the cargo warehouse management as well as optimizing the docking, loading, and unloading cargo process. The most difficult aspect of this multifaceted project to address was retail, because there is little preexisting information on its status in Venice and official data hard to obtain. However after delving deeper into the issue it was possible to identify and analyze trends and patterns in the retail store closings data and make valid conclusions on its status.

The goal of this project was to analyze the overall socioeconomic panorama of Venice with a focus on the issues of tourism, retail, and cargo. The aim of our group's research into tourism was to investigate the status of Venetian tourism and provide up to date statistical and empirical conclusions through in depth analysis. This has resulted in more updated and complete assessments of the state of Venetian tourism. For retail, our research was aimed at investigating and analyzing the trends of store closure data as well predicting future trends in order to allow for better planning and showing its relationship to tourism and cargo. With respect to cargo transport, we investigate the status of implementation of a new cargo delivery system and the logistics that delivering cargo entails, in order to produce proposals for further optimization.

3. Tourism

In a world where globalization is on the rise, travel has become more accessible to the society as a whole. World trends have indicated that tourism is on the rise. International arrivals have risen from 25 million to 846 million over the last sixty years and tourism has become the number one world wide export generating approximately $733 billion in 2006[13].

Table 1: Top 10 countries for International Tourist Arrivals and Receipts

International Tourist Arrivals						International Tourism Receipts						
Rank			million		Change (%)		Rank	US$ billion		Change (%)		Local currencies Change (%)	
	Series	2005	2006*	05/04	06*/05			2005	2006*	05/04	06*/05	05/04	06*/05
1 France	TF	75.9	79.1	1.0	4.2		1 United States	81.8	85.7	9.7	4.8	9.7	4.8
2 Spain	TF	55.9	58.5	6.6	4.5		2 Spain	48.0	51.1	6.0	6.6	6.0	5.6
3 United States	TF	49.2	51.1	6.8	3.8		3 France	42.3	42.9	3.5	1.5	3.5	0.6
4 China	TF	46.8	49.6	12.1	6.0		4 Italy	35.4	38.1	-0.7	7.7	-0.7	6.7
5 Italy	TF	36.5	41.1	-1.5	12.4		5 China	29.3	33.9	13.8	15.9	13.8	15.9
6 United Kingdom	TF	28.0	30.7	9.2	9.3		6 United Kingdom	30.7	33.7	8.7	9.8	9.5	8.5
7 Germany	TCE	21.5	23.6	6.8	9.6		7 Germany	29.2	32.8	5.4	12.3	5.4	11.3
8 Mexico	TF	21.9	21.4	6.3	-2.6		8 Australia	16.9	17.8	11.0	5.8	6.9	7.3
9 Austria	TCE	20.0	20.3	3.0	1.5		9 Turkey	18.2	16.9	14.2	-7.2	14.2	-7.2
10 Russian Federation	TF	19.9	20.2	0.2	1.3		10 Austria	16.0	16.7	2.8	4.0	2.7	3.1

Source: World Tourism Organization (UNWTO) © (Data as collected by UNWTO, 2007)

The city of Venice constitutes a portion of this world number, seeing approximately 15 million tourists every year[14]. Tourism and its related activities generate the majority of Venetian income as well as employment. Major economic sectors in Venice such as commerce, transportation, food industry, and entertainment are directly dependent upon business provided by the millions of tourists that visit the city every year. The rise of tourism has brought with it many economical benefits but not without having its social implications.

The residential comfort level of the city has seen a great decline. Every day the city's 62,000 residents see themselves outnumbered with the crowding of 25,000 to 45,000 daily tourists as well as a commuting work force of 47,000 and 25,000 students entering the *Centro Storico* from *Mestre* and other surrounding towns every day[15]. Venice's unique geography and urbanization limits the expansion of the city to accommodate the growing tourist population. Since Venice is an island, the construction of new buildings or expansions are restricted, often due to regulations governing updating of historical buildings. Venice's limited expansion capability is unlike other touristic areas that have a plethora of natural resources, such as land for expansion. With a disproportion of tourists and working commuters to residents as well as inflated prices and high costs of living, many of the city's residents opt to abandon

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[13] World Tourism Organization, "World Tourism Highlights 2006," http://www.unwto.org/index.php (accessed November 13, 2007).

[14] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

[15] Lombardo and others, *Comune Di Venezia: Servizio Statistica e Ricerca: Una Stima Della Populazione Presente Nel Comune Di Venezia Anno 2004*

the city in order to find a better quality of life. Intertwined with the Venetian residents is also the city's history and heritage which declines with the population.

Tourism has become the double-edged sword of Venetian culture. It stimulates Venetian economics, but is also cited by its residents to be its downfall and the driving factor behind much of the decline in the traditional retail sector and Venetian residency[16]. It is easy for anyone to blame all of Venice's problems on tourism but the only way to confirm whether the problems are or not associated with tourism it was necessary to conduct an analysis of tourism and its effects.

The aim of this project was to assist the city of Venice by investigating both the positive and negative effects of tourism with an emphasis on the societal costs of tourism. The team also investigated information on the updated number of tourists entering Venice as well as all the tourism entry points. Using data from past tourism IQPs, research and new data obtained from the *Comune di Venezia* the 2007 Socioeconomics IQP team conducted an overall analysis of tourism and portrayed how tourism in conjunction with commuting workers and students has an effect on residents. The team also made some recommendations for better tourism planning and management. Finally, the team wrote a chapter which summarized the tourism socioeconomic panorama to be published in a book which compiles a number of topics on Venice.

[16] Greene and others, *Residential Comfort Level: An Analysis of the Venetian Retail Sector*

3.1.Background

3.1.1. International Tourism

Globalization and the larger flow of capital, as well as the development of technologies and e-commerce have made tourism more accessible to the masses. World trends have indicated that tourism is on the rise. International arrivals have risen from 25 million to 846 million over the last sixty years and tourism has become the number one world wide export generating approximately $733 billion in 2006[17].

Figure 5: International tourism arrivals

Table 2: International Tourism Receipts since 1990

	International Tourism Receipts (billion)					Change current prices (%)		Change constant prices (%)	
	1990	1995	2000	2005	2006*	05/04	06*/05	05/04	06*/05
Local currencies						6.5	7.7	3.2	4.3
US$	264	405	474	676	733	7.5	8.3	4.0	5.0
Euro	207	310	513	544	584	7.5	7.3	5.2	5.0

Source: World Tourism Organization (UNWTO) © (Data as collected by UNWTO, 2007)

[17] World Tourism Organization, *World Tourism Highlights 2006*

3.1.2. Tourism in Venice

Large numbers of tourists frequent the city of Venice. In the year 2002, there were 14,663,000 tourists present in Venice's *Centro Storico,* of which approximately 3.6 million were residential tourists and 11 million were excursionists. Tourism has proven to be an excellent economic activity in Venice's *Centro Storico*, generating over €1 billion in 2002[18].

3.1.3. Residential Tourists

The term "residential tourists" refers to tourists who stay at least one night in Venice. It includes those who rent hotel rooms, stay in bed and breakfasts, and/or rent apartments for days, weeks, and months. Every year 3.6 million residential tourists arrive in Venice, accounting for 25% of all tourist arrivals in the city. The median expenditure of residential tourists is approximately €182.4 a day. The aggregated income from residential tourism adds up to €654 million, accounting for 60% of all tourist income[19].

[18] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*
[19] ibid.

3.1.4. Excursionist Tourists

Excursionist tourists are more commonly known as day-trippers. These are the tourists who come to Venice for the day, but do not stay overnight. Every year 11million excursionists arrive in Venice, accounting for 75% of all tourist arrivals in the city. On average, a typical excursionist spends anywhere between €34 and €46 a day. The aggregated income from excursionist tourism adds up to €441 million, accounting for 40% of all tourist income. As prices keep increasing in Venice, it is also expected for excursionist tourism to increase. The graph below illustrates the yearly number of residential and excursionist tourists as well as the amount of income gained from each[20].

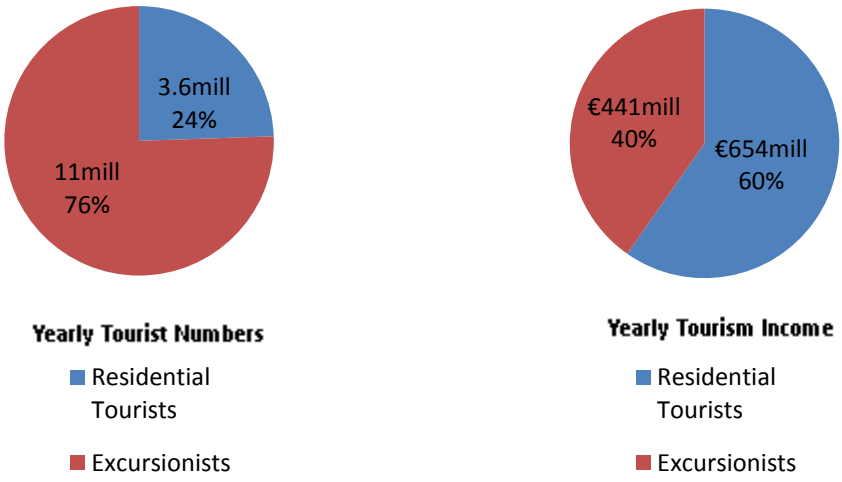

Figure 6: Yearly number of residential and excursionist tourists and income generated by each

[20] ibid.

3.1.5. Tourism Entry Points

To support the entry of such large number of tourists into Venice, the city has a respectable infrastructure which is made up by two major airports, a train station and bridge as well as properly planned inter-city and lagoon transportation system. These entry points are; Marco Polo and Treviso airport, Santa Lucia train station, the bridge to the mainland, the Venice port, *litorale nord* and *litorale sud*. The following graphic represents all tourist entry points as well as the volume of tourists coming in through each for one day during high season.

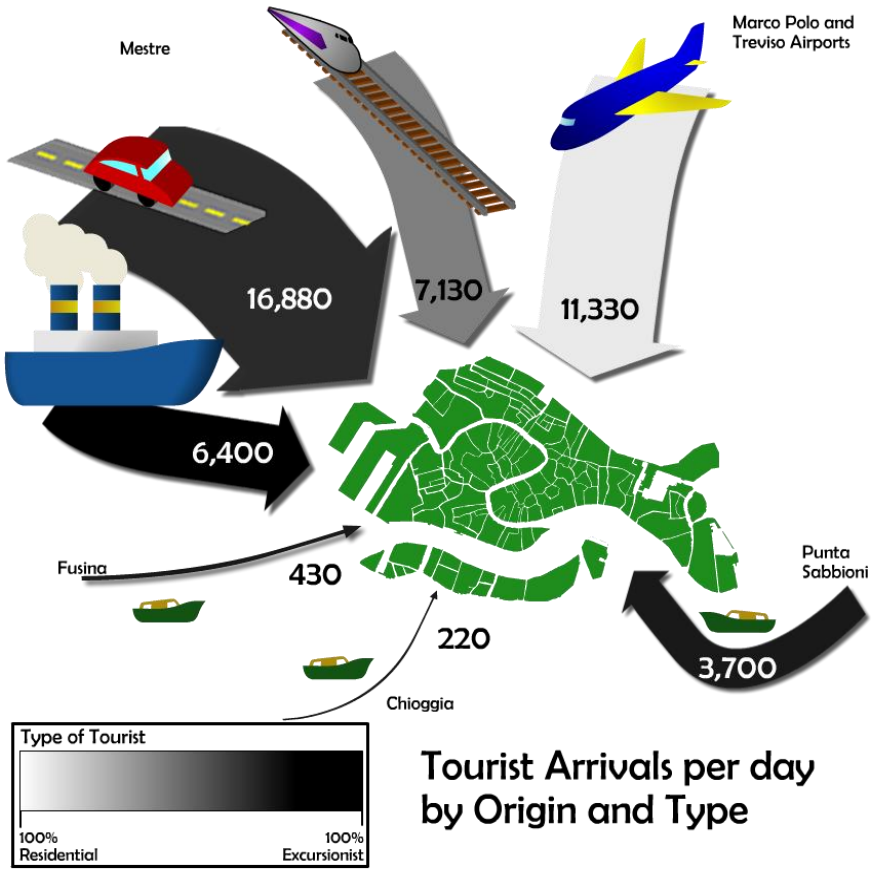

Figure 7: Representation of tourism inflow into Venice from all entry points

3.1.6. Hotel and Bed & Breakfast Infrastructure

Venice has the necessary infrastructure to accommodate a large number of tourists. Currently there are 19,101 beds in the *Centro Storico,* of which 13,728 are hotel beds. The remaining are beds at hostels, bed and breakfasts, and other lodging establishments. New policies in Venice since the year 2001 have made it possible for the arrival and success of the bed and breakfast. The bed and breakfasts build up tourism infrastructure by adding more beds for residential tourism. This change was beneficial in the stimulation of healthy competition to reduce lodging prices and subsequently increased residential tourism instead of excursionism. The number of non-hotel beds has doubled since the year 2000 from 2,508 to 5,373[21].

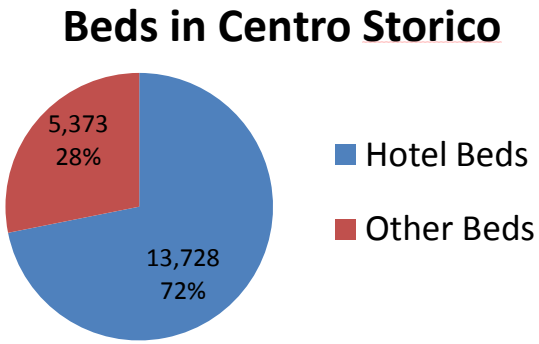

Figure 8: Number of tourist beds in Centro Storico

3.1.7. Carrying Capacity

Carrying capacity is the number of tourists that a city can hold at a time without significantly impacting the city's functions or other activities. Since tourists in Venice are not restricted to the main tourist attractions and are free to wander about, the whole city feels the effect of the carrying capacity[22]. It is possible to control the residential tourist carrying capacity because there are limited overnight accommodations in Venice; a considerable problem arises when too many excursionist tourists enter the city, unfortunately not limited by overnight accommodations. In 1991, studies and experiments indicated that the carrying capacity of Venice was 22,500 visitors, but only a maximum of 10,700 of these should be excursionists[23]. The carrying capacity limits are constantly violated, especially during the summer months with peak days of more than 45,000 tourists. The worst day for Venice tourism was "Black Sunday" in 1989 when there were over 150,000 tourists in the city[24].

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[21] ibid.

[22] Schady and others, *An Assessment of the State of Tourism in Venice -- a Quantitative Estimate and Characterization of Excursionist Tourists.*

[23] Antonio Paolo Russo, "The “Vicious circle” of Tourism Development in Heritage Cities," *Annals of Tourism Research* 29, no. 1 (2002), 165-182.

[24] Kate Hairsine, "Venice Sinks in a Sea of Tourists," http://www.dw-world.de/dw/article/0,,2626174,00.html (accessed September, 2007).

3.1.8. The Positive Effects of Tourism

When analyzing respective data pertaining to Venetian economy, the importance of tourism as a driving socioeconomic force in Venice becomes even clearer. According to estimates made by the World Travel Guide, tourism provides 70% of the total income of Venice, and it is responsible for the generation of at least 50% of the jobs[25]. In actuality the unemployment rate for Venice is 4.2% as opposed to an Italian national rate of 8.7%, showing that Venice is comparably in excellent standing[26]. Out of the twenty regions that compose the Italian territory, the Veneto is ranked first in terms of its quota of the Italian tourism, being the destination of 12.2% of all tourist movements to Italy or within Italy[27]. Moreover, from the €28 billion spent in Italy during the year of 2004 by foreign tourists, the Veneto region accounted for €4.4 billion while over €2.4 billion were spent solely in the commune of Venice, as shown in the graph below[28]:

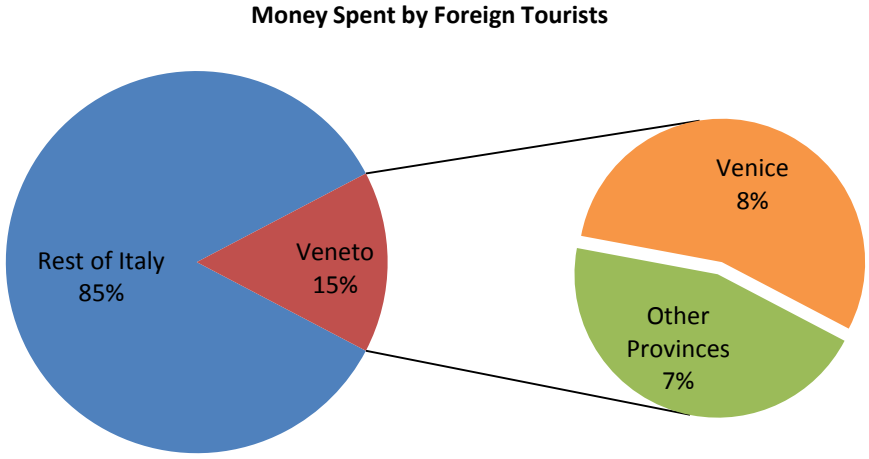

Figure 9: Money spent by tourist in the region of Veneto in comparison with the rest of Italy

There are also a number of less obvious benefits for the city of Venice. The millions of visitors, who carry the Venetian reputation back to their home countries and advertise by word of mouth, also raise awareness for city needs. Several institutions such as Save Venice and Venice in Peril exist, promoting the global awareness of Venetian issues and raising funds to restore and preserve the *City of Water*. Groups like these are responsible for over 250 restorations all over the city[29]. In addition, the population enjoys an efficient and a well planned public transportation system, which is mainly supported by tourism. The substantial influx of tourists in Venice and the city's dependency on the

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[25] *Venice Business Profile*
[26] Citta di Venezia, *Area Dei Servizi Statistici Ed Ecografici*
[27] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*
[28] ibid.
[29] "TED Case Studies: Venice and Tourism," F:\References\VENICE xpo.htm (accessed November 31, 2007).

money generated from it, act as a strong political argument on behalf of Venice. It attracts large amounts of investments, both from international organizations and from the Italian government.

3.1.9. The Negative Effects of Tourism

One of the main problems easily found by anyone visiting the island is pedestrian traffic. Heavy pedestrian traffic and crowding in the city lower the residential comfort level by making it more difficult for Venetians to get around the city and go about their daily duties. On any given day, there are at least 89 foreigners on average for every 100 Venetians residents. This is the highest tourist-to-resident ratio in Europe. To put this in perspective, it is nine times that found in the Italian city of Florence[30].

Figure 10: Tourist congestion around Rialto

During high season the ratio of foreigners to residents is even worse with approximately 45,000 tourists, 47,000 working commuters and 25,000 students coming in every day[31]. The ratio then becomes 100 foreigners for every 53 residents. This is the main residential comfort problem and is represented in the flow diagram below.

[30] Robert C. Davis, *Venice, the Tourist Maze: A Cultural Critique of the world's most Touristed City* (University of California Press: Berkeley, 2004), 360.

[31] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

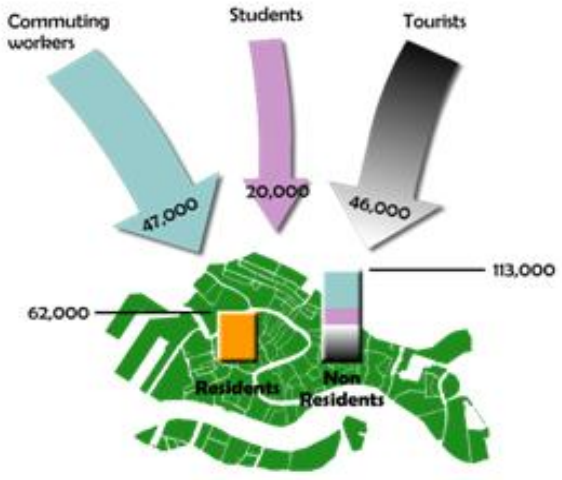

Figure 11: Venetian Residents vs. Non-Residents

One of the first documented negative effects of traffic generated by tourism in the isolated city of Venice is the physical wear and tear on the infrastructure of the city. Every year, the millions of tourists that traverse the city literally break it apart. A walk across any of the numerous bridges in Venice is evidence of this when one views the middle of each step worn down whole centimeters just from the passage of people over them. Stones are breaking off the traditional architecture and public art is becoming more and more worn and less recognizable due to tourist contact.

Figure 12: Side stairs on the Rialto worn down due to the passage of tourists

All this wear and tear leads to huge costs for the city of Venice in order to maintain, not even restore – these worn façades of past Venetian culture. Every year, the Venetian government spends close to €250 million on costs associated with tourism[32]. Other than the infrastructural maintenance,

[32] ibid.

repair, and restoration there is also the cost of dealing with all of the garbage and waste generated by the millions of tourists, cost of law enforcement, and environmental pollution. While adding to the amount of garbage in Venice, tourists also add to the amount of litter on the streets. Due to the high cost of food and other items in Venice, day trippers are becoming an increasingly popular trend. These day trippers often bring bagged lunches and leave their garbage behind[33]. So, while they consume nothing from the city and do not usually contribute economically to it, their only contributions are garbage, wear and tear, and congestion.

Figure 13: Tourists illegally eating lunch in St Mark's Square and one of Venice's few trash receptacles

Due to this issue and other related ones Venice has not only created a branch of government called the Office of Decorum but also started fining for infractions that seem relatively minor on the large scale of problems in the city. Offenses now cited include dropping soda cans and food wrappers on the ground, dipping feet into the fabled canals, sleeping in the shady alleys, picnicking on ancient paving stones, and even walking around without a shirt. Walking down the street sans shirt can be subject to a 50 to 500 euro fine ($70 to $700)! (Venice Tourists Must Stay Respectable or Face Fines) These rules and regulations are a necessary consequence of an aging city regularly overpopulated by tourists.

[33] Schady and others, *An Assessment of the State of Tourism in Venice -- a Quantitative Estimate and Characterization of Excursionist Tourists.*

Figure 14: Sign showing rules enforced by the hostesses and one of Venice's nude statues

Venice has actually hired "hostesses" in tourist hot spot areas such as St Mark's square. These multilingual women carry badges, copies of the new rules, and cell phones to call for reinforcements when necessary. These hostesses' sole job is to prevent tourists from violating city rules such as sitting down to eat their bag lunches in undesignated zones or falling asleep in public areas of interest.

Figure 15: Various instances of rules being enforced on tourists

3.1.10. Social Effects

Socially, one of the farthest reaching effects of tourism in Venice is the astronomical cost of living. Rents have sky-rocketed as the 'rich and famous' have bought Venetian real estate, but while fortunes are paid for water-side villas, the landlords tend to be absentee or itinerant. Consequently, in winter Venice is deserted, except for the dwindling local population and tourists[34]. The sky-high prices of real estate in Venice have caused a resident migration. For example, in Venice, a 100m^2 (1,075 sq ft) property can cost up to €1 million. This is two or three times the price of comparable, newer, properties less than 6 km away in *Mestre*[35]. With cheaper living costs, less crowding and a higher comfort level only 6km away, many Venetians have decided to migrate to the mainland. The number of residents in Venice has been decreasing from 150,000 in 1950 to only about 62,000 in present day[36].

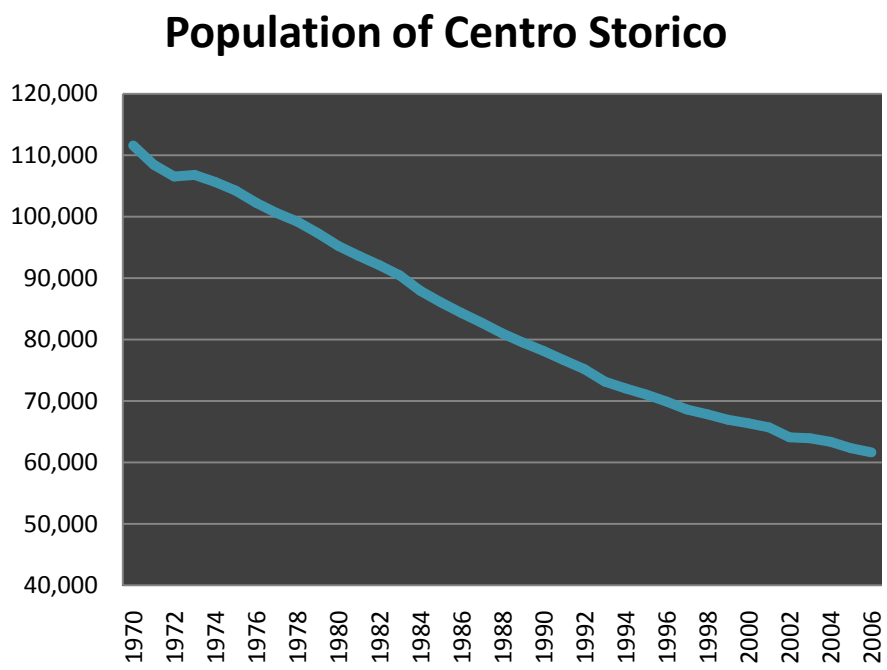

Figure 16: Population of Venice's *Centro Storico* between 1970 and 2006

[34] Russell Dr Staiff, *Contemporary Tourism Issues: Venice a Case Study* (Richmond, NSW: University of Western Sydney Hawkesbury.

[35] "Venice in Peril as Tourists Flood and Locals Get Out," *The Times*5th April 2007, .

[36] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

3.1.11. Heritage City Status

In 1987 the entire city and the lagoon were added to the World Heritage List.
There are strong heritage rules in operation about the external appearance of city buildings.
Keeping a whole city restored, especially given the exceptionally difficult and unique physical environment, is extremely difficult and made more difficult by severe financial restraints. The problem of being a heritage city - there is a demand to freeze the city in the past. Modernity is either consciously expelled or hidden on the outside but all the creature comforts of tourists are demanded on the inside of hotels, museums etc[37].

3.2. Methodology

This project's intent was to assist the city of Venice in studying and giving an assessment of the socioeconomic impacts of the influx of tourism. To fulfill our wide-ranging mission statement we established the following main objectives for our project:

i. Establish updated numbers of tourism influx and infrastructure
ii. Assess benefits and detriments of tourism
iii. Express effects of high tourism influx

Our project will be geographically bounded by the *Centro Storico* as our main study area. Our project focused mostly on activities related to research and data analysis.
The sections that follow provide details about methods, tools, techniques and approaches used to achieve our main project objectives. In detailed form, this chapter will explain every aspect of the team's methodology to re-evaluate the assessment of the state of tourism in Venice and write a chapter on tourism in Venice.

[37] Staiff, *Contemporary Tourism Issues: Venice a Case Study*

3.2.1. Establishing updated counts numbers of tourism influx and infrastructure

While doing research for our project, we realized that there were varying numbers on the influx of tourism into Venice. We suspected that the past collected data may be outdated and therefore, to assess the current status of tourism our team obtained the most accurate and up to date information possible. To do this our team used the *Turismo a Venezia* 2005 data. We have found that this data provides the most accurate trends, statistics, and information on Venetian tourism available. It is the official data collected and put together by the *Comune di Venezia*, which is the municipal government. This data was vital in assessing the changes in Venice tourism and allowed us to draw meaningful conclusions and create accurate and far reaching graphical expressions of the tourism situation. From this tourism packet we also found the number of bed and breakfasts and hotels.

3.2.2. Assessing benefits and detriments of tourism

In order to analyze the socioeconomic tourism panorama the team found it important to assess the benefits and detriments of tourism. To assess the social benefits and detriments of tourism the team mostly reviewed past IQP's and did research. A major factor in assessing economic benefits and detriments was by obtaining official data from the city on the income generated by tourism and the costs incurred by tourism on the city. Other benefits and detriments were also assessed by observation of tourists, traffic, and city infrastructure in popular tourist areas such as St. Mark's square.

3.2.3. Expressing the influx of tourism for a day in high season

In order to quantify and display information in form of a killer graphic about the influx of tourism for a regular weekend peak day the team had to do some calculations based on the data found in the *Turismo a Venezia* 2005 booklet and the Tourism 2000 IQP project. The team first looked up the available data about all of Venice's entry points which are mainly; Marco Polo and Treviso airport, Venice Port, Santa Lucia train station, Tronchetto, Piazzale Roma, Punta Sabbioni, Zattere, and Chioggia. In the year 2000 the tourism IQP group had already counted the amount of tourists entering Venice through the last six locations and had extrapolated their results to estimate the tourist numbers for a weekend day during high season. Their counts and calculations resulted in a total of 28,140 tourists coming in through the last six of the mentioned entry points[38]. Our job was to calculate the entry numbers for the other three locations. The data we obtained from the tourism packet stated that during a month in high season, in this case being august, the total traffic of passengers either beginning or ending their trip in Venice through Marco Polo airport in 2004 was 611,225[39]. To get the number of only incoming traffic for the month we divided 611,225 by 2, assuming that half of the total traffic was entering Venice. To get the number of incoming passengers for one day, the team assumed that the

[38] Schady and others, *An Assessment of the State of Tourism in Venice -- a Quantitative Estimate and Characterization of Excursionist Tourists.*

[39] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

traffic would be about equal for every day of the month and thus divided the resulting number from the last calculation by 2. We ended up getting a result of 9,858 tourists coming in through Marco Polo airport for a day during high season. The calculation was as follows:

$$611{,}225 \cdot \frac{total\ \ traffic}{mont\ h} \cdot \frac{1\ (incoming\ \ traffic\ )}{2\ (total\ \ traffic\ )} \cdot \frac{1\ mont\ h}{31\ days} = 9{,}858 \text{ total incoming traffic per day}$$

To find the amount of traffic coming in through Treviso Airport for one day during high season was a little more difficult because the team only had data that stated the total passenger traffic from the whole year. For the year 2004, the total passenger traffic of Treviso was 891,704[40]. The team assumed that the traffic pattern for Treviso airport would be similar to that of Marco Polo airport during the same season, therefore we figured out what percentage of the total yearly traffic did one day in august account for. To do this we divided the result from the last calculation by the total amount of yearly traffic through Marco Polo airport which is 5,843,960[41] and got a ratio of 0.00168. We then multiplied this ratio by the total yearly passenger traffic of Treviso airport to get the daily traffic for a day during high season. The total incoming traffic for a day in August at Treviso Airport turned out to be 1505 incoming passengers. The calculation was as follows:

$$891{,}704 \cdot \frac{total\ \ traffic}{year} \cdot \frac{9858\ {}^{incoming\ \ traffic}/_{day}}{5843960\ {}^{total\ \ traffic}/_{year}} = 1505 \text{ incoming traffic per day}$$

To quantify the amount of traffic coming in through the Venice port the team took the amount of incoming tourists for the month of August from the Turismo a Venezia packet and divided it by 31 to get an average amount of incoming port passengers for one day. The data stated that 198,423 tourists came in through the Venice port for the month of august[42]. This number was divided by 31 to approximate the number of tourists coming in per day. The resulting number of incoming tourists for a day was 6,401. The calculation is as follows:

$$198{,}423 \cdot \frac{incoming\ \ traffic}{mont\ h} \cdot \frac{1\ mont\ h}{31\ days} = 6{,}401 \text{ incoming traffic per day}$$

For the daily traffic inflow in a weekend day during high season for remaining entry points, the team used the tourist counts from the Tourism 2000 group. The data is found in the table below[43].

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[40] ibid.
[41] ibid.
[42] ibid.
[43] Schady and others, *An Assessment of the State of Tourism in Venice -- a Quantitative Estimate and Characterization of Excursionist Tourists.*

Table 3: Results from the Tourism 2000 IQP group

	Weekday	Weekend Day
Tronchetto	6,766	8,481
Piazzale Roma	5,231	8,402
Santa Lucia	5,303	7,130
Punta Sabbioni	4,629	3,702
Zattere	352	425
Chioggia	219	
Totals	**22,500**	**28,140**

The tourist inflow traffic amounts from all entry point were then added up to estimate the total number of tourists coming in to Venice for one day during high season.

3.2.4. Expressing the relationship between tourism influx and residents

To express the relationship between tourism influx and residents the team reviewed the data of inflow of tourists in conjunction with the numbers of inflow of commuting workers and students. The team then went on to create a graphic that represents the disproportion of residents to non-residents during a day in high tourist season. This graphic can be found in the results section.

3.3. Results

3.3.1. Tourist entry points influx

After conducting the analysis of all Venice entry points for a day during high season, the team was able to construct a graphic representing all tourism entry points and the number of tourists coming in through each entry point as well as a table with the corresponding information. The table also includes the total number of commuting workers and students that come into Venice's *Centro Storico* every day. The total number of tourists turns out to be 46,123 while the total number of commuters equals 72,000. The resulting number of aliens coming into the city for a day during high season is 118,123[44,45].

Table 4: Tourist entry points with the number of inflowing tourists for a day during high season

Entry Point	Number of Tourists
Marco Polo Airport	9,858
Treviso Airport	1,505
Santa Lucia Train Station	7,130
Tronchetto	8,481
Piazzale Roma	8,402
Venice Port	6,401
Fusina-Zattere	425
Litorale Nord	3,702
Litorale Sud	219
Total:	46,123

[44] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

[45] Schady and others, *An Assessment of the State of Tourism in Venice -- a Quantitative Estimate and Characterization of Excursionist Tourists.*

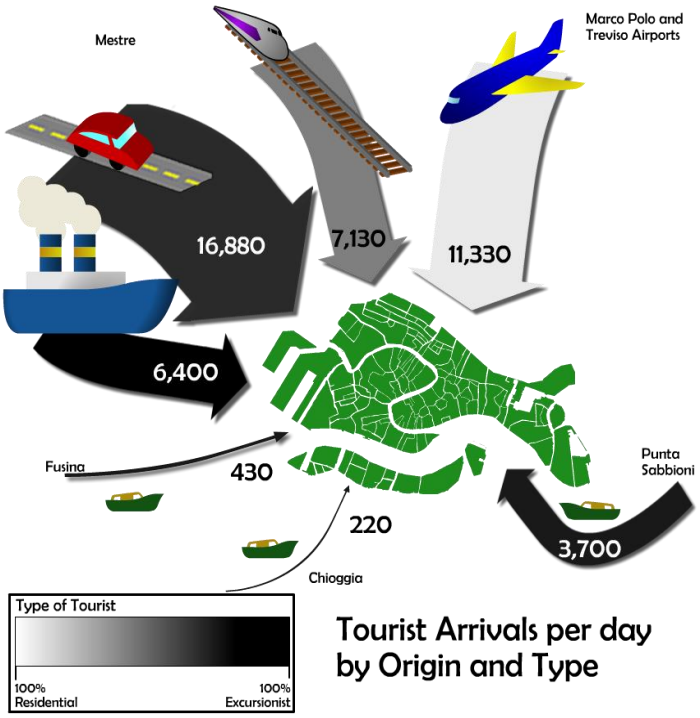

Figure 17: Inflow of tourist through Venice's entry points in a day during high season

3.3.2. Resident vs. Non-residents

A second graphic was also constructed from the analysis using the number of commuting workers and students in addition to the tourism entry points. The second killer graphic depicts the inflow of all aliens into *Centro Storico* in contrast to the number of residents[46].

Table 5: Total numbers of non-residents other than tourists entering Venice every day

Commuters	Number
Workers	47,000
Students	25,000
Total:	72,000

[46] Lombardo and others, *Comune Di Venezia: Servizio Statistica e Ricerca: Una Stima Della Populazione Presente Nel Comune Di Venezia Anno 2004*

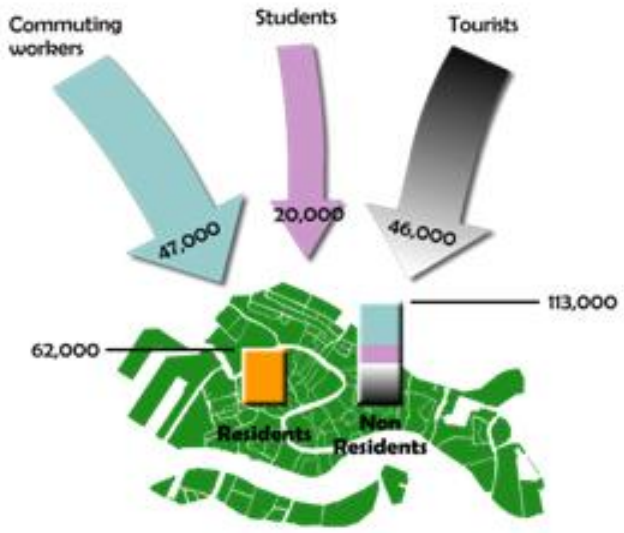

Figure 18: Representation of everyday non-resident inflow vs. Venice's present population

3.4. Discussion

It is clear to see that tourism has economic benefits for the city of Venice but when analyzed socially, the high price of living and the large influx of tourists, commuting workers and students coming in every day contribute to low residential comfort level and thus residential decline. In 1950 there was approximately 150,000 people living in the city[47]. Current numbers show that a more consistent average is 62,000, with about 2000 people dying every year and a mean age of 50 years. If the current declining trends continue it is predicted that Venice may be a ghost town within fifty years[48]. There have been a large number of schools closed over the last fifty years. One of the last kindergartens in the historic centre of Venice was closed on April 6th, 2007 and turned into Venice's 231st hotel. This is a significant symbol of Venice's development into an almost strictly tourist based city[49].

As of 2006, 25% of the population was over the age of 64[50]. The Venetian director of CORILA, the organization that orchestrates Venice's scientific activities is quoted as saying "We desperately need more young people. One way to attract them is to build up the university and high-tech sectors."[51] Although this may seem as a good idea to keep the youth of Venice from migrating elsewhere, it becomes nearly impossible to modernize Venice due to its "Heritage city" status and restrictions.

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[47] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*
[48] John Hooper, "Population Decline Set to Turn Venice into Italy's Disneyland," *The Guardian*26th August 2006, .
[49] *Venice in Peril as Tourists Flood and Locals Get Out*
[50] Hooper, *Population Decline Set to Turn Venice into Italy's Disneyland*
[51] *TED Case Studies: Venice and Tourism*

Keeping a whole city restored, especially given the exceptionally difficult and unique physical environment, is extremely difficult and made more difficult by severe financial restraints. The problem of being a heritage city is that there is a demand to freeze the city in the past. In 1987 the entire city and the lagoon were added to the World Heritage List. There are strong heritage rules in operation about the external appearance of city buildings[52]. Becoming a heritage city may have the benefit of keeping aesthetic values but it also brings with it some detrimental social implications. The picture below illustrates typical Venetian façades.

Figure 19: Typical Venetian façades

Venice, a heritage city and its residents, has become overwhelmed with tourism. This influx of tourism may well be the cause of residential decline. Perhaps the infrastructural heritage of Venice can be kept alive through aesthetic restrictions, but with a declining population it is possible that the city may be slowly losing the breathing heritage that gives it life. Some have said that if the residential decline continues, Venice may become no longer a city of history and heritage but rather a place that tourists visit and leave with no citizens left to upkeep the heritage of the city. Venice has experienced a large increase in the number of tourists and the overall infrastructure and boundaries have become saturated.

A simple, immediate, and practical approach to alleviate the tourism problems is by promoting more residential tourism and reducing the number of the less-beneficial excursionist tourists. *The vicious cycle of tourism development in heritage destinations* suggests: the imposition of tariffs on those who do not book a hotel room, or other forms of "disincentive" to excursions. An advance booking system based on telecommunications could easily be integrated with the free issue of a «City Smart Card» to those who reserve, granting a series of benefits to their owners (Van der Borg and Russo,

[52] Staiff, *Contemporary Tourism Issues: Venice a Case Study*

1998): a win-win solution that is recently gaining support in political circles. On the contrary, taxation on overnight stays – such as hotel-room taxes – reveals contra-productive as it discriminates against staying visits[53].

The benefits of this approach would theoretically be an increase in tourism income from those who stay more than a day and a decrease in the number of the less-beneficial excursionists who are only visiting for a short period of time during the day and not purchasing any necessities. This suggestion has not been implemented, therefore its practical effects on tourism income and numbers has not been verified. Others have abandoned all possibility of finding a solution and have said, "If you love Venice, let her die"[54].

There are obvious conflicts between personal opinions on the future of Venice, but one thing is for sure, Venice has been and still is one of the most wondrous cities in the world. Worldwide, tourism is one of the most rapidly growing economic sectors and historically and aesthetically rich cities like Venice are experiencing this strong growth. As long as the city exists, tourism will continue to support it and destroy it. An important aspect of tourism that is currently being analyzed is that in order for the city to sustain tourism increases, economic interests must be balanced among the infrastructural, environmental, social, and economic constraints of the city – long term as well as short. Without this balance, tourism can lead to loss of local traditions and gradual impoverishment of social structures.

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[53] Russo, *The “Vicious circle” of Tourism Development in Heritage Cities*, 165-182

[54] Rachel Campbell-Johnston, "If You Love Venice, Let Her Die," *The Times*5th June 2006, .

3.5. Proposal

Given some of the problems caused by tourism the team felt the need to make proposals for a future analysis of tourism planning. We know that excursionist tourism is the less beneficial type of tourism for Venice because it generates more trash, traffic, and less income for the city as opposed to residential tourism. For this reason, we propose that the city of Venice should try to find some ways of promoting residential tourism instead of excursionist tourism. One measure that could be taken is heavier taxing for excursionists, a suggestion made by Van der Borg and Russo in 1998: the imposition of tariffs on those who do not book a hotel room, or other forms of "disincentive" to excursions. An advance booking system based on telecommunications could easily be integrated with the free issue of a «City Smart Card» to those who reserve, granting a series of benefits to their owners[55]. This measure would potentially provide a greater incentive for more residential tourism, which in turn could potentially increase the city's income from tourism and place more of a limit on tourism given the fact that residential tourism is bounded by the number of beds available in Venice.

Another tourism generated problem is that the increase of real estate prices in the city has made the cost of living higher for residents. If the city were to make the attainment of real estate for local Venetians more accessible through the use of incentives, it could possibly reduce the rate of residential decline and bring more youth to the city. Such incentives could be in the form of tax and interest rate reduction as well as a wider variety of assistance for buyers. An incentive to bring more youth to the city could be in the form of reduced rent for college students and discounts for companies that are started and housed in Venice. In order to make these incentives possible the city could use the income generated from higher tourism taxes to finance the incentives.

The city of Venice also faces a trash problem; many tourists litter because there are not enough trash receptacles. A person may have to walk many blocks before finding a place to dispose of trash properly. To alleviate the trash problem this team proposes that more trash receptacles should be placed around the city. The city could enforce more of the fines through the office of Decorum in St. Mark's square and use the income from the fines to finance the placement of more trash receptacles throughout the city as well as the extra workers needed to maintain these receptacles.

Finally this team would also like to propose that a program be designed that would automatically update the entry point tourist numbers periodically based on real data of incoming air traffic, trains, cruise ships and touristic buses as well as past tourist trends in order to predict the flow of tourism into *Centro Storico* for days or weeks throughout the year. This would be beneficial for better tourism management and especially for inner city traffic planning. Having the capability of predicting tourist influx into the city could have the traffic benefit of planning how many tourist boats or taxis would have to be out on the lagoon and canals for a given week to satisfy the tourist transportation demand.

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[55] Russo, *The “Vicious circle” of Tourism Development in Heritage Cities*, 165-182

4. Retail

Retail can be defined as the set of various marketing practices directed toward the purchasing and selling of goods and/or merchandise, often including the performance of services for consumers and other businesses. The retailer purchases goods or products in large quantities and then sells smaller quantities to the end-user for a profit. Retail establishments, often called shops or stores, are a common business throughout the civilized world; retail stores are the most common proprietorship in the world. However, unfortunately for retail store owners, worldwide retail sales for independent grocery stores have decreased drastically[56]. Due to the dynamic nature of economics and more specifically trading, there are a number of factors that affect the development and evolution of retail stores and many world issues such as industrialization, globalization, and the influx of tourism often have major effects on retail. Since the origin of the retail system, many changes and advancements have been made resulting in improved mass production and lower product prices, improved policy and increased free trade, and improved comfort levels and product availability. These positive outcomes are not without seemingly negative socioeconomic effects as well. Over time, global trends and inevitable consequences of societal development, (such as the expansion of multinational companies and a reduction of the barriers for tourism) have caused a decline in retail store success.

Venice is a culturally and historically rich city attracting an increasing number of tourists per year, currently in the millions. It is the second most visited place in all of Italy, next to Rome. Conversely, the Venetian population and the number of retail stores are steadily and rapidly decreasing as the population ages, fertility rates drop, and more and more retail stores close their doors indefinitely. The popular belief among the majority of Venetians and a number of people worldwide is that the influx of tourism in Venice is causing the decline of traditional retail and food stores. Often, many of these traditional stores specialize in a specific food and are located in close proximity. When one of these stores closes, people often choose to go to another central location where they can get all of the products and goods they need in one place. This causes strain on the remaining stores and eventually they must close due to a lack of customer base. When this happens, residents are forced to travel farther to obtain the goods they need for everyday life and prices can be increased drastically because of the lack of competition.

In the past twenty years, there have been several studies conducted on issues affecting the Venetian citizens' daily lives. The evolution and the transformations of traditional Venetian retail stores have been the focus of research done by Worcester Polytechnic Institute students for a number of years. Based on their work and research, databases filled with population, census, and retail store information are now available, as well as maps laying out the city's retail, residential, and tourist areas. The afore mentioned groups' goal was to catalog and document the changes in retail over the years in order to explain the current retail trends and to find whether or not the future of all retail in Venice is in danger and, if it is, the reasons for that. This was accomplished by examining Venetian retail stores and their histories, population demographics, and by attempting to create a rough "comfort index" to

[56] "US Department of Labor: Grocery Stores," http://www.bls.gov/oco/cg/cgs024.htm (accessed 10/20, 2007).

empirically determine the convenience with which Venice's citizens could obtain goods and products. One of the most recent groups obtained a version of a cataloging system from the City of Venice used for recording opening of stores, description, and location dating back to 1970[57]. They were able to use this database to verify and supplement the oral histories they obtained through interviews.

A substantial amount of research has been conducted and data collected, but definitive conclusions and data counts on the trends and causes concerning the decline of the Venetian retail sector have never been formally reported. Most of the data collected thus far can be categorized as pertaining to stores that are currently open in Venice, how these stores have changed over time, and how the comfort level has changed during the retail evolution. In past projects, original assumptions were made that tourism has overtaken food shops, that the aging population is at least inconvenienced by the retail and food store situation, that supermarkets drive out traditional "mom and pop" stores and are rejected by the general populace, and that people prefer small stores. However, the deeper that this issue has been investigated the more counterintuitive previous hypotheses become and the more multifaceted the issue was realized to be.

Our group's work in Venice focused on collecting all of the data from past research, as well as new data from the 2006 retail database. Our team managed to derive some explanations on the effects of tourism on Venetian retail, trends associated with residential decline as well as a small analysis of the evolution of retail stores.

[57] Luis M. Rodriguez and others, *Decline of Stores as a Gauge for Social Change*,[2006]).

4.1. Background

4.1.1. Italian Retail

Venice is an ever changing economic state driven by tourism and related economic factors such as retail. In order to understand the trends developing in the retail sector and general economics, one must first have a comprehensive background on the history and current state of retail in Venice and even Italy as a whole. From the time of World War II, the country of Italy has moved from a largely agricultural based economy to an industrial one. Italy has since developed into the world's sixth largest market economy[58]. Since the fore mentioned shift, Italy has depended on the import of food as well as natural resources used for industry.

4.1.2. Venetian Retail

Venice is geographically isolated on all sides by water. This forces Venice to twice import goods – first from outside of Italy and then from the mainland to the island and even then the goods must be distributed to the shops, stores, and restaurants in Venice. Another interesting contributor to Venetian economy is the street vendors. These vendors are rarely taxed, if at all. Almost 27% of Italy's gross domestic product is not accounted for due to the lack of taxation. These vendors can be found throughout the island of Venice selling a multiplicity of products. This untaxed commerce doesn't help anyone but the individual vendors[59].

The retail sector of Venice is an ever changing element of the socio-economic environment in Venice. Venice is a city of numerous laws - many of which have been "on the books" for centuries, but rarely enforced, if ever. John Berendt mentions in his books *The City of Falling Angels* that if the average Venetian "added up all the taxes and fees you supposedly owe, you'd have to pay something like one hundred and forty percent of your income"[60]. These laws are fluid and always changing and the retail stores change accordingly in response. Up until June 11, 1971 Venice only required an informal licensing agreement in order to operate a retail store. It was then that Venice finally began to require specific and limiting operating licenses for these stores according to the goods they offered (Law 426). Then in 1998, Law 114 was passed. This law allowed any store fewer than 250 square meters to be able to open and operate with little more than notifying Venice of their opening and plans[61]. This allows the large majority of Venetian stores to operate without a formal license, but there is still some tracking done on the basis of the store opening notifications.

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[58] *US Department of Labor: Grocery Stores*
[59] ibid.
[60] John Berendt, *The City of Falling Angels* (New York: Random house, 2005), 414.
[61] ibid.

Due to the fact that 70% of Venetian income and 50% of jobs are supported by tourism[62], it is possible for the retail situation to spiral out of control. In order for Venetian citizens to be able to maintain some standard of living, it becomes necessary to preserve non-tourist related retail and food stores. Taking these background fundamentals into account, our group worked to probe deeper into the system that is Venetian Retail.

The strictest laws regulating tourist shops are placed on two of Venice's most famous areas, the Rialto Bridge and St. Mark's Square. Store licenses from other areas are non-transferable to these two regions. This limit does not apply exclusively to tourist shops in these areas, but bars and restaurants as well. If a shop closes in this area then one is able to move in, but the absolute number of stores in the region is fixed, such as the 870 stores in the *sestiere* of San Marco.

4.1.3. Tourism Effects on Retail

Tourism is a major factor in the stimulation of retail because tourists are usually the only people willing to pay for the often overpriced items in *Centro Storico*. However, those tourists who pay for overpriced items only facilitate inflation. For other tourists who are not as inclined to overpay or who simply cannot afford to overpay visiting Venice can become a burden. For some of these tourists day-tripping is the answer, where they save money by not having to pay for an overnight hotel stay. This is less of a problem for Venetians, who pay at least 30% to 40% less than tourists because they are locals[63].

To illustrate this, Franco Conte the head of the Venetian branch of Codacons, the Italian consumer rights group is quoted saying, "If you are Italian, a croissant and a cappuccino cost €3.50", he said. "If you speak another language, it costs €7. In restaurants, a pizza and a drink for two people costs between €20 and €25 for locals, perhaps cheaper for Venetians - but €50 to €60 if you are *forestieri*". *Forestieri* refers to foreigners and literally translated means "from the forest" or foreigner[64].

Tourism is cited by most Venetians and even many outsiders, to be the main cause for the declining traditional food stores. The rise of tourism in conjunction with residential decline and world retail trends have caused a decline in the number of traditional and basic necessity stores such as butchers, bakers, and grocers.

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[62] *Venice Business Profile*
[63] Berendt, *The City of Falling Angels*, 414
[64] ibid.

Figure 20: Representation of basic necessity stores in 1971 vs. 2001

However, a decline in the number of traditional food and basic necessities stores does not necessarily mean a decline in the retail sector as a whole. Since the total number of retail stores is not declining, it means that touristic and non-food shops have been replacing traditional retail stores. There is a decline in traditional retail stores in Venice that may be related to an evident influx of tourism related stores. Between 1990 and 2000 the number of traditional retail stores has decreased from 675 to 575. Seventy-five of those stores were providers of basic need items like bread, meat, and vegetables. In the same period the number of restaurants has increased by 110 and the number of bars has increased by 77[65]. This fact does not necessarily mean that this is an inherently negative result of tourism.

Figure 21: One of the few traditional food stores left in the sestiere of San Polo

[65] Greene and others, *Residential Comfort Level: An Analysis of the Venetian Retail Sector*

The rise of tourism has also brought with it a demand for tourist oriented shops such as souvenir or high fashion clothes shops. The change of a retail sector is usually influenced by a transformation in the economy and physical surroundings. Based on demand in an area, the population an area must adjust its selection of products or supply. A high tourist population, for example, will most likely increase touristic product demand such as ready made food or souvenirs. An area such as Saint Mark's Square contains 870 open stores, and as can be expected, many stores are targeted at tourists such as jewelry, Murano glass, and souvenir shops. It has been found in numerous cases that if a food store or traditional retail store closed and a tourist related shop such as a mask or souvenir shop did not replace it, it would remain empty and the city would lose one more source of commerce.

Figure 22: Many traditional food stores in San Marco have been replaced by tourist shops such as jewelry stores

In 2002, the Euro, which was rapidly spreading across Europe, was introduced to Italy. When Italy adopted the Euro in place of the traditional Lira, prices all over Italy increased drastically and were hit especially hard in Venice – an already overpriced and economically unfavorable retail setting. In a time when locals were unwilling to spend frivolously, tourists were the major contributors in maintaining Venetian commerce and income.

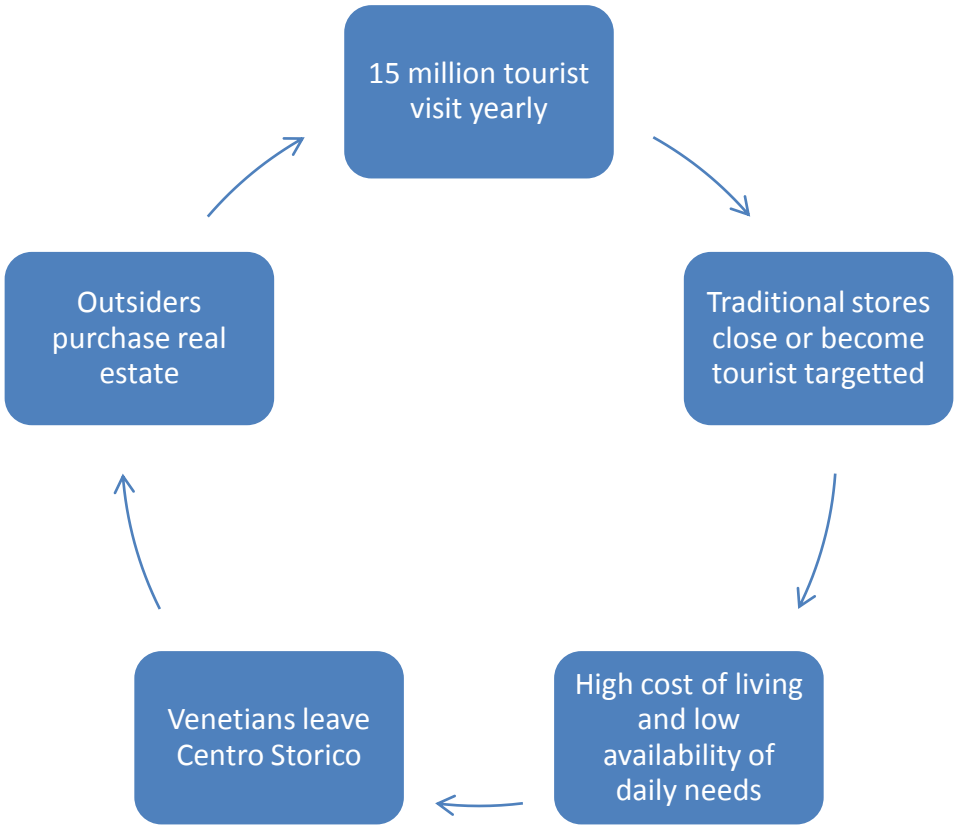

Figure 23: It has been proposed that tourism affects retail in the above cycle

4.1.4. Social Trends effects on retail

Another aspect that needs to be taken into consideration when analyzing the Venetian retail dilemma is social trends. Young Venetians are opting to move away from Venice in search of lifestyles more like other more modern cities. These young people often go to college instead of taking over the family business. When the owner of a traditional retail shop retires, it is customary for him to hand over his store to his children, however this next generation tends not to be interested in the small shop owner life of long hours with little incentive.

In accordance with world trends towards modernization, family dynamics are also changing. Family size is smaller today than in the past. Rossella Palomba, of the CNR National Institute for Population Research has found that Italian couples feel under strong pressure to become parents - but "one child is enough to fulfill this social duty"[66]. So Italy has become the land of the single bambino or bambina: a quarter of women born in 1963 have only one child. Even eating habits have changed. Traditionally, Venetian families would all eat together for the majority of daily meals. People worked close to home and could travel back for meals very easily. With commuting distances increasing,

[66] Rolf Goetze, *Understanding Neighborhood Change : The Role of Expectations in Urban Revitalization*Ballinger Pub. Co., 1979.

workers often can not come home for lunch; it is much easier to eat out. Without large meals being made at home, less food is purchased from stores.

4.1.5. Residential Comfort Level

Why does the decline in traditional retail matter? Comfort level. Within the scope of retail, comfort level is defined as the ease in which consumers can obtain their basic necessities such as bread, meats and poultry, and fruits and vegetables. With a mean population age of fifty years[67], comfort level is a serious issue in Venice because as more stores close, people must walk farther in order to obtain their basic necessities. An example of basic necessity comfort level of the sestieri of Dorsoduro is shown below. It can be seen that for most of the islands which make up the *sestieri*, the basic necessity comfort level is either below average or low.

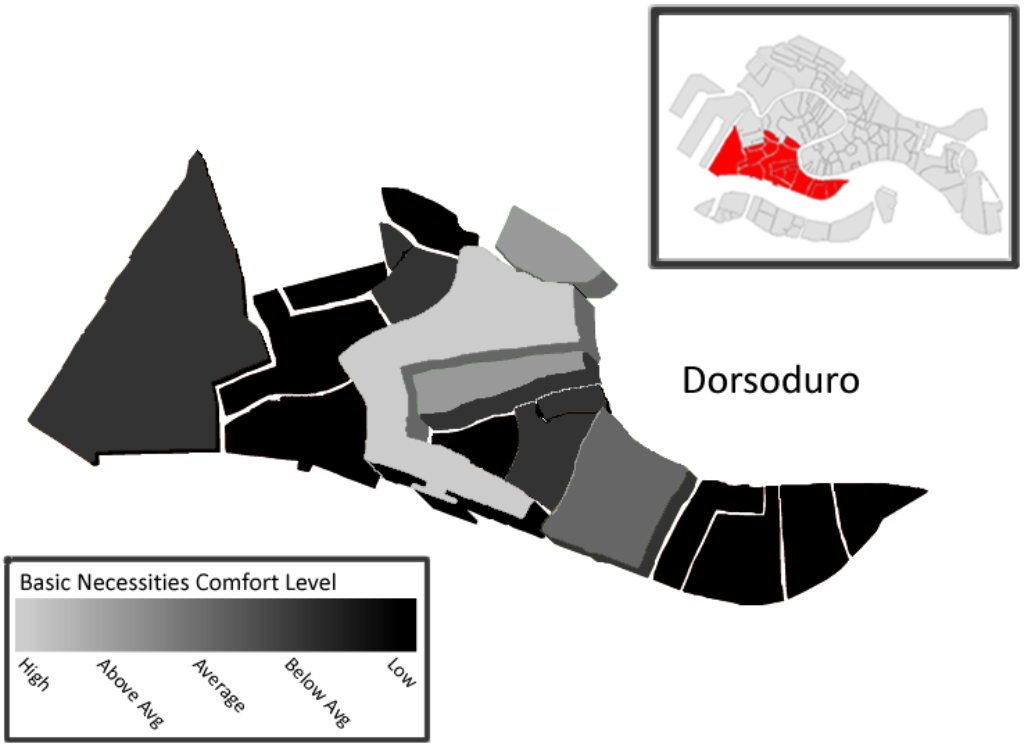

Figure 24: Many of the islands in Dorsoduro have low basic necessities comfort levels

The ability to obtain daily needs in one area is beneficial, convenient, and appealing to people. In Venice's past it was common to find clusters of basic needs stores. Within a small neighborhood or block, typically there would be a butcher, grocer, baker. The importance of the proximity of cluster stores is that they rely on each other to offer different products. It is detrimental if one cluster store is

[67] Citta di Venezia, *Area Dei Servizi Statistici Ed Ecografici*

not able to operate profitably or meet the local demand. If one of the stores closes, then the other stores next to it will suffer. A consumer may venture to another area to do his/her daily shopping, which in turn takes business away from the original sellers. In addition, if a bigger store such as a supermarket contains a wide variety of goods, it will probably replace the need to shop at three or four smaller retail stores. However, if a store with a diversified selection of basic necessity products such as a supermarket is not very near, then the comfort level of a resident is not necessarily increased. This often results in residents travelling to regions with higher comfort levels and lower costs of living such as *Mestre* which is only 6km away seem more attractive to Venetian residents.

Figure 25: Closed food store on one of the low comfort level island in Dorsoduro

One theory about the level of comfort for an individual is presented by Christopher Bates. His theory states that there is a formula pertaining to the willingness of a person to travel in order to obtain his needs. $P = F \cdot \frac{k}{t^2}$ is his derived formula which can be described as the following:

P = the willingness of the consumer to travel to the area where his needs are located
F = the area of the store
k = the physical attractiveness that the store can offer to the consumer
t = the time it takes for the consumer to travel to the location

A value of P greater than 1 demonstrates a greater willingness for an individual to travel elsewhere to obtain his daily needs; whereas a number below one shows that an individual is less willing to travel a greater distance or to other areas to a destination to obtain products.

Taking into account the daily needs of the Venetians, the formula can show the overall satisfaction of the Venetians and why they will travel to the mainland to obtain their needs. Factored into the formula is the lack of availability and attractiveness that Venetian stores have to offer their inhabitants. While the local shops around them might have the basic necessities that they need, these shops may not have the selection that the Venetians prefer. Although this may seem trivial, one must remember that as society advances, demands increase beyond basic needs. A store may provide the necessities a Venetian needs such as basic living needs, but some luxuries are often desired. The stores on the mainland become more desirable to the shopper because of the wider availability of selection. Also, there are different modes of reliable, accessible and cheap travel to the mainland such as train, bus, and boat[68].

4.1.6. Effects of Supermarkets on Retail

The reasons Venetians shop for food at different types of stores is unique to each individual shopper. When quality and personal connection are indispensable, people tend to still favor small food stores, while the majority of Venetians purchase their food products at supermarkets. It is true that many citizens complain about the recession of small food stores and are very nostalgic for the old Venice, where one would visit the same butcher, baker, and grocer every day. For many, supporting these traditional businesses is within their means, but they still choose the convenience of the supermarket. This type of trend is not unique to Venetians. It actually mirrors the general trend in most parts of the world. In modern society where convenience and low prices are important, the majority of people prefer to use supermarkets.

[68] Greene and others, *Residential Comfort Level: An Analysis of the Venetian Retail Sector*

Figure 26: One of the Billa supermarkets in Venice (*Strada Nuova, Cannaregio*)

A small analysis of 25 food stores and 4 supermarkets in the *sestieri* of *Cannaregio* showed that with the arrival of the 4 supermarkets between the year 2000 and 2005 all 25 food stores closed. Within that small sample of stores, 40% of the food stores were lost with the arrival of the supermarkets while the other 60% was replaced by other food stores. This small analysis is not enough to prove that supermarket openings is causing a decline in traditional food stores but it is fair to say that it may very well be one of the main contributing factors. Below is a graph representing the decline of traditional food stores from 1971 to 2005 as well as the increase in store closures[69].

[69] Greg Chandonnet and others, *The Evolution of Stores and Decline of Residential Comfort: The Availability of Necessary Goods in the Historical Center of Venice* (Worcester, MA: Worcester Polytechnic Institute,[2004]).

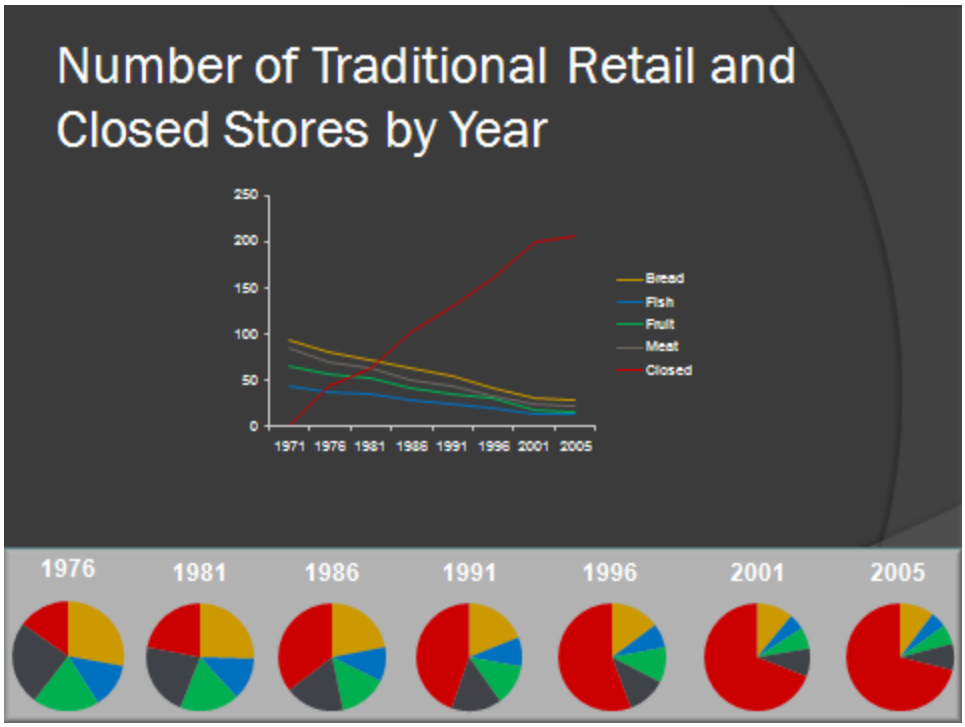

Figure 27: There has been a steep decrease in the amount of traditional food stores since 1976

4.2. Methodology

The ultimate goal of our work with the Venetian retail sector is to research, discuss, and draw conclusions on the evolution of the retail sector and its social and economic effects, as well as the cause of its decline. Our objectives were established as follows:

i. Describe the evolution of the retail sector and its impact on the Venetian population
ii. Explain causes of trends and patterns in updated retail data
iii. Assess the impact of and general economic trends and mainly tourism on retail and establish the relationship between tourism and retail

4.2.1. Describing the evolution of the retail sector and its impact on the Venetian population

The first step to determine retail status in *Centro Storico* was to update past IQP data. This was accomplished by taking the most recent official retail store database (2006) and comparing it to the old IQP databases which were compiled through field work and survey. We also produced over twenty queries in order to organize and find patterns in the data. The updated information was used to find problems with both the old and new databases as well as draw meaningful conclusions. It was displayed in visual means to show the progression of a declining retail sector in Venice.

4.2.2. Representing an evolution of store openings by decade since 1920

To represent an evolution of store opening by decade the team ran some queries on the retail database. First we ran a query to divide the retail stores by food and non-food stores. After that, the team ran a second query that divided the store openings by decade. All the points were mapped on map info and color coded by food or non-food stores. We then imported the maps by decade into flash and created an interactive graphic that displays every retail store opening from 1920 to 2000. This graphic fully utilized the new retail database by dividing it between food and nonfood stores. It shows all the openings and closing over the last eighty years and can be sorted by decade to compare and contrast retail evolution and trends.

4.2.3. Explaining causes of trends and patterns in updated retail data

Most of the developed world has been dealing with a decreasing retail sector. The trends and patterns have been analyzed and discussed. One of the most accepted theories so far is the Central Point Theory. This theory focuses on the characteristics of a changing retail sector. Since Venice contains many unique identities, one of the assessments that will be made in this field will be to address Venice by molding other theories to fit Venice's unique situation. All information regarding retail in current literature should be separated into categories of theory. Each different review analyzes retail in a different way. All the information is helpful and therefore, themes should be organized so that each one can be evaluated and addressed to the city of Venice. For our analysis our group compiled definitions in order to give an overall explanation of each theory and compile a list. This list helped to act as a best fit curve for the situation regarding Venice. Multivariable data analysis will enable stronger suggestions and solutions to the problems.

Also another pertinent issue that was considered was the current problems the retail sector is facing such as outside influences causing the decay and making it harder for the stores to stay open. Using the new database, we were able to establish into what the stores were converted. This information led to meaningful conclusions about current retail store situations.

Figure 28: From 1978 to 1995 this store in Cannaregio was actually a toy store, but because of the lack of children in the Centro Storico it is now a tourist targeted jewelry store

4.2.4. Assessing the impact of tourism, demographics, and general economic trends on retail

Tourism is considered by most Venetians to be the main cause for the declining retail sectors. One of the main objectives of the group is to review the current situation to establish the relationship between tourism and retail development and decline. We proposed the idea that the tourists are keeping the retail sector alive. By analyzing past conclusions and the new databases, we were able to confirm our proposition.

As with much of the other two projects we were responsible for this term, our group did the majority of our retail work in data collection, manipulation, organization, and analysis. Due to the fact that we had new data we could provide meaningful graphical representations and conclusions.

One method for the presentation of the information in order to reflect the current state of the retail sector was to create animated maps showing not only the decline in stores but also the change in comfort level over time. It identifies areas where more stores have closed - the areas that should be addressed as more trouble areas for the retail section as well areas that are in less danger and have been able to maintain their traditional stores will be represented by lighter colors. We have also created a number of graphical representations of number of traditional food stores over time.

In order to express the relationship between the large influx of tourism and the retail sector, we decided to create a map that showed at the same time the tourist density and the number of retail stores by *sestiere*. The data of tourist density by *sestiere* was not explicitly available and was obtained

through an extrapolation of some data taken by the Tourism 2000 project. By defining paths in Venice the should be the most representative of the tourist density, this group obtained the following counts:

Table 6: Results of density counts by the Tourism 2000 IQP team

	San Marco	Cannaregio	Castello	Dorsoduro	Santa Croce	San Polo
Tourists	6,247	4,014	1,704	1,503	426	3,378

These numbers do not represent an absolute count of tourist, but rather a relative count, and can only serve as a representation of the tourist ratio between *sestieri*. Therefore, we used the proportions between these numbers, to divide the 46,000 tourists that we estimated for an average day during high season. The following table shows our results.

Table 7: Results of our extrapolation for number of tourists by *sestiere*

	San Marco	Cannaregio	Castello	Dorsoduro	Santa Croce	San Polo	**Total**
Tourists	16,637	10,690	4,538	4,002	1,134	8,996	47,997

We used these numbers, which we represented as a color from a red gradient, and the number of open stores in Venice by *sestiere* from the 2006 database, which we represented as cylindrical bars, to make the following graph:

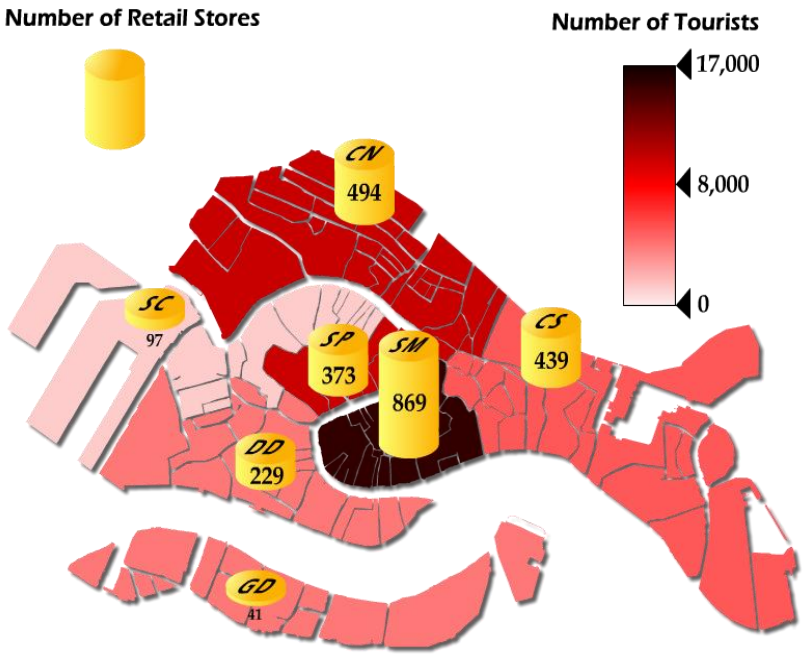

Figure 29: Number of Tourists and Retail Stores by *sestiere*

In order to make this graph more useful for our IQP final presentation, we later on colored a portion of each of the yellow bars with green, showing the number of food stores, out of the total stores by *sestiere*. The resulting graph is shown on the results section.

4.2.5. Analysis for *Cannaregio* retail evolution

To construct a small evolution of a portion of the retail stores in the *sestiere* of Cannaregio between the year 2000 and 2006 we looked at the retail database obtained by Retail '06 IQP group. We first decided that due to time limitations we would only look at the 1000+ entries in Cannaregio for food stores and supermarkets in the database. The team identified the 4 major supermarkets in Cannaregio and their opening dates. There was one Billa, one Ok Sigma and two Coops. It turned out that these supermarkets all opened after the year 2000. In order to find out what effect the supermarkets had on the neighboring retail stores we looked in the database for all food stores that closed or were replaced after the year 2000. The team was able to identify 25 stores that closed between 2000 and 2006. All 25 stores and 4 supermarkets were mapped on MapInfo to find their exact location and then exported to macromedia flash. We then proceeded to create an animation that displayed the opening of the 4 supermarkets in that time period as well as the store closures all in chronological order. It was difficult to assess the closing dates of the retail stores because these are not included in the database, but the team was able to estimate the closure dates of the stores by finding the opening dates of the stores that replaced them. The stores and supermarkets used for this analysis are outlined below. The *sestiere* combined with the civico are the exact address of the store.

Table 8: Supermarket openings in Cannaregio

Supermarket	Sestieri	Civico	Opening date
Coop	CN	4612	2000
Coop	CN	1976	7/24/2001
Ok Sigma	CN	2661	2/27/2004
Billa	CN	3660	5/3/2004

Table 9: 25 Traditional food store closures in Cannaregio

Opening	Sestiere	civico	Description	Replacement Date
6/2/1997	CN	4273	SETTORE ALIMENTARE	3/16/2000
2/14/1961	CN	3808	SETTORE NON ALIMENTARE	9/22/2000
9/8/1988	CN	2686	SETTORE NON ALIMENTARE	5/5/2000
2/18/1980	CN	2668	SETTORE ALIMENTARE	4/30/2001
12/18/1996	CN	2222	SETTORE ALIMENTARE	10/4/2001
8/29/1997	CN	1976	SETTORE ALIMENTARE	7/24/2001
10/22/1979	CN	4545	SETTORE ALIMENTARE	6/10/2002
9/13/1974	CN	3378	SETTORE NON ALIMENTARE	5/17/2002

3/27/1995	CN	2678	SETTORE ALIMENTARE	4/24/2004
10/27/1999	CN	1589	SETTORE ALIMENTARE	3/1/2002
1/26/1989	CN	116	SETTORE ALIMENTARE	12/16/2002
4/4/1978	CN	6364	SETTORE NON ALIMENTARE	10/9/2003
11/24/1995	CN	2753	SETTORE ALIMENTARE	2/10/2003
8/12/1992	CN	1367	SETTORE ALIMENTARE	12/23/2003
8/29/1997	CN	1296	SETTORE NON ALIMENTARE	8/26/2003
1/9/1968	CN	1698	SETTORE NON ALIMENTARE	12/20/2004
2/26/1994	CN	5984	SETTORE ALIMENTARE	5/13/2004
1/20/1995	CN	1903	SETTORE ALIMENTARE	1/30/2004
1/20/1972	CN	1523	SETTORE NON ALIMENTARE	4/8/2004
10/4/1999	CN	1519	SETTORE NON ALIMENTARE	6/22/2004
7/30/1997	CN	5049	SETTORE NON ALIMENTARE	10/10/2005
11/14/1991	CN	3682	SETTORE NON ALIMENTARE	11/25/2005
2/29/1988	CN	2498	SETTORE NON ALIMENTARE	7/25/2005
11/12/1990	CN	55	SETTORE ALIMENTARE	2/17/2005
9/29/1994	CN	1116	SETTORE ALIMENTARE	1/3/2006

4.2.6. Assessing the 2006 Retail Database

Deficits in the 2006 retail database did not make it possible to conduct an accurate analysis, therefore the team decided to make a proposal for a new retail database. In order to figure out what data our proposed database should include, the team assessed the benefits and deficits of the 2006 retail database as well as the benefits and detriments of another retail database constructed by the Retail '05 IQP group[70,71]. Once the benefits and deficits of both databases were assessed, the team proceeded to construct the proposed retail database columns. The benefit-deficit assessment is outlined below.

[70] Rodriguez and others, *Decline of Stores as a Gauge for Social Change*
[71] Greene and others, *Residential Comfort Level: An Analysis of the Venetian Retail Sector*

4.2.6.1. Retail 2005 Database

Benefits

- Tells you an exact description of what the store is. Ex; Souvenir, bookstore, etc.
- Gives ISTAT codes for stores and has a key that describes what each code means
- Has some store closure dates

Deficits

- Does not have all opening and closing dates

4.2.6.2. Retail 2006 Database

Benefits

- It tells the exact opening date of every retail shop
- Includes all retail shops in Venice
- It tells whether the shop is active or not

Deficits

- It does not have any store closing dates
- Many of the store descriptions are too generic
- There is no key describing what every code means

4.2.7. Retail-Cargo Demand Analysis

This analysis was performed as follows. We began by obtaining the coli demand per island per day data from the Cargo 01 project. Using MapInfo we were able to obtain data on which island codes are part of which sestiere and then using database queries able to combine the sestiere data with the cargo demand data. By totaling coli demand per sestiere we were able to find the values for all seven regions. Due to the fact that the demand information did not take into account size of the sestiere, the area of each sestiere was needed. Using MapInfo we obtained the area for each of the 125 islands and added them according to sestiere. Lastly by dividing the total coli cargo demand by the obtained area of each sestiere, we were able to obtain the Demand/Area values for each as seen in the table below.

Table 10: Total demand by area for each *sestiere*

	Total Coli Demand	Area (m^2)	Demand/Area
CN	34685	1,213,567	0.0286
CS	32826	1,577,705	0.0208
DD	18041	843,021	0.0214
GD	12829	868,373	0.0148
SM	9142	449,631	0.0203
SP	12356	290,719	0.0425
SC	8055	1,061,933	0.0076

4.3. Results

4.3.1. Effect of tourism on Retail Stores

In an attempt to understand and express the relationship between tourism and retail, one of the main purposes of our research, we created a graph that shows at the same time the number of tourists on an average high season day and the number of retail stores by *sestiere*.

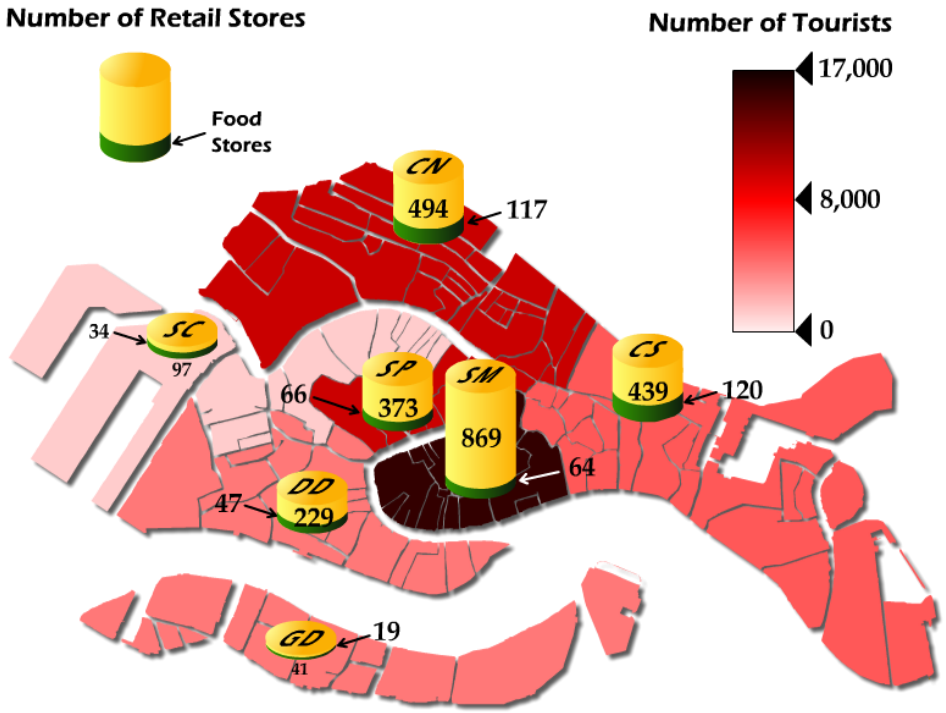

Figure 30: Number of Tourists, Food and Non-Food Stores by *sestire*

The bars were divided between green and yellow to show the ratio of non-food stores to food stores. This was an attempt to relate the influx of tourism to the type of demand that they generate, and to the type of stores that open on the most "touristed" areas.

4.3.2. Retail store openings by decade

This graphic fully utilized the new retail database by dividing it between food and nonfood stores. It shows all the openings and closing over the last eighty years and can be sorted by decade to compare and contrast retail evolution and trends. Notice how the percentage of food stores reaches a peak in the 1960s and then begins to decline. This is caused by the rise of tourism in Venice after the World War II.

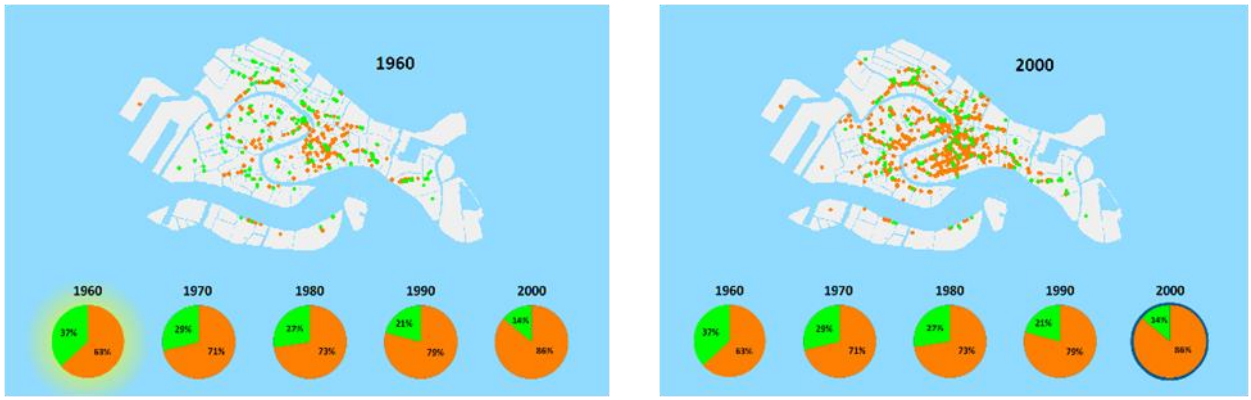

Figure 31: Food and non-food openings in 1960 and 2000
Notice from the pie charts that food store openings decline by 23% since 1960's

4.3.3. *Cannaregio* retail sample analysis

A small analysis of the Cannaregio data is not enough to prove that supermarket openings are causing a decline in traditional food stores but it is fair to say that it may be one of the main contributing factors. We found that out of 25 of the food stores only 1 survived while 40% of the stores were replaced by non-food stores. This means that 40% of the 25 food stores were lost while 60% was replaced by other food stores.

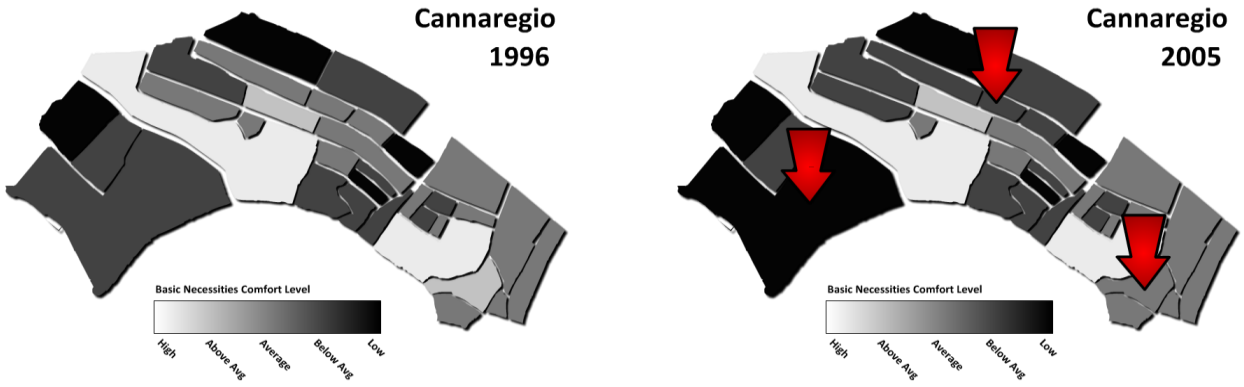

Figure 32: Decline of the basic necessity comfort level in Cannaregio from 1996 to 2005

This goes to show that with some analysis, it is possible to construct an evolution of the Venetian retail sector with the database from the Retail '06 IQP team. One of the major deficits of this database is that it does not contain the closing dates of the retail stores which are important in order to construct an accurate evolution analysis. Another deficit in the retail database is that the store descriptions are too generic. For example: *Settore Alimentar*e and *Settore Non-Alimentare Generico*. The database had a code after each store description but the significance of this code was unknown to all students, advisors, and even employees of the commerce department. The generic descriptions of the stores in the database impeded the team from categorizing the retail stores into groups of tourist, resident, or mixed shops. This would have been useful for an analysis of how tourism shops may be taking over the Venetian retail sector. With a retail database containing proper information such as specific store descriptions, closing dates, and proper ISTAT (Italian National Institute of Statistics) codes, it would make it easier to analyze and identify patterns of store openings, closings and replacements instead of having to guess for many cases.

4.3.4. Retail-Cargo Demand Analysis

One of our team's original theories concerning the interrelationship between tourism, retail, and cargo was that tourism is a stimulant of cargo by way of stimulating Venetian retail. However, we have actually found through data analysis, that this is in fact only partially true. We actually found that areas with the highest volume of tourists do have the highest number of retail stores. An example of this is the *sestiere* of San Marco which on any given day in tourist season can have up to 17,000 tourists[72] walking its streets and contains 869 retail stores. We expected this *sestiere* to also have the most daily cargo demand. We found that San Marco ranked fifth out of the seven *sestieri* with respect to *colli* demand per area (m^2) with less than half of the demand per area of San Polo. The stores that have more cargo delivered to them are food stores because they require daily deliveries. This analysis leads us to conclude that tourism does not necessarily stimulate cargo deliveries.

[72] Schady and others, *An Assessment of the State of Tourism in Venice -- a Quantitative Estimate and Characterization of Excursionist Tourists.*

4.4. Discussion

The Venetian retail situation is a multi-faceted issue with a number of influencing factors. Due to the dynamic nature of economics and more specifically trading, there are a number of factors that affect the development. The evolution of retail stores is affected by many issues such as industrialization, globalization, and the influx of tourism and it is a dynamic ever changing cycle. As more research was conducted by our group, we were convinced that tourism is not pushing out the traditional retail stores of Venice. The declining population is a major factor because as the population declines, the traditional stores lose their clients. The high cost of rent in the city also becomes an issue for store owners. The arrival of the supermarkets is also partly to blame as can be seen from our Cannaregio analysis. As a society moves toward modernization, efficiency and time management have become very important to many individuals, therefore purchasing their daily necessities at supermarkets becomes more beneficial and traditional food stores lose their attractiveness. Trying to cite one specific aspect of life such as Tourism as the sole cause for traditional retail decline is an over simplification. The decline is more likely a combination of social and economic factors such as costs of living, politics, population loss, employment, and world economic trends.

In cities like Venice, it is easy for the city's socioeconomics to be overtaken by the tourism industry without proper regulation. In order to keep Venetians on the island, it is vital that measures be taken to preserve both residential areas as well as food stores so citizens can lead lives comparable to that of other cities. The Venetian government has taken steps to help regulate tourist shops in certain areas, as well as given incentives to shop owners in some of the residential areas. Short-term traditional retail will survive, however its future is not known. If it is to sustain itself, a balance between traditional and touristic retail and their influencing economic factors must be attained in order to preserve the traditional retail stores and the Venetian residents.

4.5. Proposal

4.5.1. Proposed Database

Due to the deficits the team found in the current retail store database, we found it necessary to propose a new database which would be better suited for conducting analyses. In order to figure out what data our proposed database should include, the team listed the benefits and deficits of the 2006 retail database as well as the benefits and detriments of another retail database constructed by the Retail '05 IQP group. Once the benefits and deficits of both databases were assessed, the team entered the titles of the database columns. The proposed database columns are outlined below.

Table 11: Proposed Retail Stores Database

Sestieri	Civico	Open Date	Closing Date	Attiva/Cessata	Store Description	Tourist,Non-Tourist or Mixed	ISTAT Code	GIS mapping code

ISTAT Code key table
Significance of every code

4.5.2. Government Regulation

After careful review of the data that has been complied one is able to see that there is a decline of traditional food stores. The comfort level of local citizens has gone down with the closure of many stores and the rise of prices of goods. There is not enough concrete information to state whether or not this is due to an increase in tourism. Although there are some cons to tourism, it still helps to stimulate the fiscal economy in Venice. The group finds that there should be more research and investigations to reach a better understanding and conclusion. Current recommendations to the Venetian government would be to implement a way to increase the level of comfort to the daily citizens by increasing the number of stores where daily goods can be obtained. It may be beneficial to institute a cap on the amount of tourist related stores that can be established based on the population of local citizens. For future students, the group would like to see more data collected and possibly the implementation of our proposed database in order to create a better analysis of the situation.

4.5.3. City Comfort Level Index

Recommendations to improve the comfort level of citizens include investigating positive influences on citizen life and how the city can implement these need/wants. Rather than concentrating on tourism and trying to understand its influence, it is important to concentrate on the citizens. If the city can inventory each store and evaluate its goods on a defined index of comfort and accessibility to goods, the index could be used and improved to directly benefit citizens. The city would then be able to see where to add stores that inventory basic necessities for the citizens. Although the addition of new buildings for stores is not practical because of the geographical limits of Venice, replacing a closed store or aiding a failing store will benefit both store owners and surrounding citizens.

The group recommends that future work include a survey to understand where the greatest needs within the population are and specifically, where in Venice these populations are located. This survey and resulting analysis could be presented to the city so that city officials could take the proper action to create a better area, fulfilling the needs of their citizens. The storeowners could also benefit from these surveys by understanding the needs of citizens and tourists who shop at their stores and optimizing their product and thus performance.

The group also determined that it would be beneficial to update the current system of "comfort level" analysis. There is a lack of statistically meaningful data provided by the current analysis formula. Data collection needs to be more complete and thorough in order to conduct a comprehensive and beneficial analysis of this data. As a result, future work should include increased and broader data collection. Additionally, the formula $P = F \cdot \frac{k}{t^2}$, which takes into account the quality rate of selection could be used[73]. To use the formula for Venetian retail, a survey of each store needs to be completed in order to calculate the quality rate and efficiency level. Using this information a store will be able to calculate its desirability level as seen by its customers. A Venetian store owner could then compare him/herself to bigger stores on the mainland. The analysis of competition rate would help store owners reevaluate their current inventories and increase their position on the "comfort level" index.

[73] Chandonnet and others, *The Evolution of Stores and Decline of Residential Comfort: The Availability of Necessary Goods in the Historical Center of Venice*

4.5.4. Home Delivery System

As the current population of Venice increases in age it becomes more and more difficult to accommodate their needs. To increase the comfort index of the elderly our group proposes that a home delivery service should be implemented by some stores. The elderly citizens can call the stores and have their necessity items delivered to the comfort of their home[74]. Although this system would initially be more costly as more hired help would be required for delivery, this cost should be offset by an increased comfort level and convenience. In the long run the implementation of this service and its widespread availability could potentially stimulate Venetian retail.

4.5.5. Residential Satisfaction

One of the factors that are weighted most in satisfaction when buying goods is the expected cost of a certain item. In Venice, where a large number of shoppers are tourists, the price of commodities is often quite high. Residents would like to shop for basic necessities without having to spend exorbitant amounts of money. This cost distribution discrepancy (what the citizen feels he/she can spend vs. what he/she must spend) would be an advantageous input into the index database and calculations. The cost distribution should also evaluate data regarding the cost of opening and renovating a store and determine if it is possible to open a store and sell goods within a reasonable price range without losing money.

[74] ibid.

5. Cargo Transportation

Managing the operations responsible for the delivery of products and goods is rapidly becoming a large scale problem in many countries. Rising levels of traffic congestion, increasing demand for goods, negative environmental impacts, inefficiencies of current methods, and politics contribute to making cargo distribution a daunting task for any city. When the cargo transportation threatens the quality of life of individuals, strategies must be developed to improve transportation efficiency and ensure the health and safety of the city and its people.

The problem of cargo transportation is a rising concern in the water-locked city of Venice. Venice's isolated geography and distinct infrastructure result in a unique transportation system, which compounds all the preexistent transportation problems. As John Berendt describes in *City of the Falling Angels*, the key to understanding Venice is to realize that the city moves with the rhythm of the water, the canals and the tides[75]. The dynamics of Venetian transport, more specifically cargo transport, is also dependent on this "rhythm".

However, as time progresses and major cities around the globe strive for modernization and better urban planning, Venice struggles to adapt its ancient infrastructure to the necessities of life in the twenty-first century. The introduction of motorized boats on its canals after World War II resulted in an increase in travel and trade. Currently, more than a thousand motor cargo boats are needed to supply all deliveries of food, equipment and retail goods on the islands[76]. However, the introduction of motorboats has in turn led to the introduction of a number of new social, economic, and environmental problems for Venice such as the *moto ondoso*, or the wakes generated by the propellers used by these motorboats. In waterways such as the small, intertwining Venetian canals, these wakes hit the walls, largely contributing to erosion and deterioration, and permanently damaging the foundations of nearby buildings.

Substantial research efforts have been devoted to developing methods to reduce the effects of the *moto ondoso* on the walls of the canals. However, it is very clear at this point that the problem must be addressed at its source: something must be done to reduce the overall boat traffic in Venice. The cargo transportation system, which is responsible for 30% of all movement on the Venetian waters besides public transportation[77], must receive individual attention, and thus several projects, particularly Worcester Polytechnic Institute IQPs, have been completed with the objective of analyzing its specific organization and studying ways to optimize its logistics and distribution methods.

Our project addressed the process of restructuring the freight transport in Venice by looking at all the collective efforts that have been made in this area from an outside perspective, and by critically analyzing the results, impacts, successes and failures experienced thus far. Building on the studies and

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[75] Berendt, *The City of Falling Angels*, 414

[76] Tucker and others, *Re-Engineering the City of Venice's Cargo System for the Consorzio Trasportatori Veneziani Riuniti.*

[77] Transcare AG, *Venetia City Logistics: Internal Interim Report*,[2003]).

conclusions made by previous IQPs, more specifically the 1997 and the 2001 cargo related projects[78,79], we worked to investigate and establish the overall state of the cargo transportation in Venice, define where the re-engineering of the cargo transportation stands currently in term of implementation and report on these findings.

5.1. Background

5.1.1. Cargo Transportation and the Economy of Venice

As with any other city composed of islands, Venice greatly depends on trade to obtain the products it relies on to function smoothly. The city's economy is stimulated by tourism. In turn the constant growth and influx of tourists presents a permanently increasing demand for goods. These products must be delivered to stores, markets, and restaurants that support the 15 million people that visit the city every year[80].

Once the goods reach the island, they must be redistributed to numerous delivery points around the *Centro Storico* of Venice through the only available means: the Venetian Canals. Cargo transportation is also the main source of goods for all economic activities located on the islands. Along with that fundamental responsibility, there is also a strong urgency for efficiency in this distinct cargo transportation system. Every business in the *Centro Storico* depends on these cargo boat deliveries for their function and growth, which in turn permits the success of the Venetian economy.

Figure 33: Cargo boat traffic on the Grand Canal

Each day, cargo of all kinds arrives in Venice on trucks, which come through *Il Ponte della Libertà* – the only access for road vehicles between the city and the mainland. The merchandise is then

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[78] Karolyn Amlaw and others, *Optimization of Cargo Boat Deliveries through the Inner Canals of Venice* (Worcester, MA: Worcester Polytechnic Institute,[1997]).

[79] Tucker and others, *Re-Engineering the City of Venice's Cargo System for the Consorzio Trasportatori Veneziani Riuniti.*

[80] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*

unloaded at *Scalo Fluviale*, the main boat loading area on the *Centro Storico* of Venice, situated right next to the *Tronchetto* parking area (see Figure 34). From *Scalo Fluviale*, cargo boats of all types and sizes depart loaded with products to attend the demand of the 125 islands that compose the city of Venice[81].

Figure 34 - Tronchetto Area and *Scalo Fluviale*

The cargo transportation is a very important aspect of maintaining a comfortable lifestyle for Venetian residents. Currently the cargo transportation system lacks an efficient organization and administration system. Many problems have arisen, and the need for change is immense. The problems currently being addressed, pertaining to cargo transportation include traffic, wait times, inefficient runs, safety, and lack of organization.

[81] Tucker and others, *Re-Engineering the City of Venice's Cargo System for the Consorzio Trasportatori Veneziani Riuniti.*

Figure 35: Five boats docked side by side at *Scalo Fluviale*

5.1.2. Traffic

One of the most prevalent problems for cargo transportation is traffic on the canals. There has been a large influx of motorized boats generating excessive transit. This results in an increase of both noise and air pollution as well as increasing the effects of *moto ondoso.* Every day, amid a crowd of gondolas, private boats, taxis, and cargo boat drivers strive to travel to their destinations in timely manners. The congestion due to traffic creates longer, more expensive trips for the cargo boatmen as well as others that utilize boat travel. The amount of traffic increases wait time on the delivery of goods, and lowers the efficiency rate of production. It also limits maneuvering space for docking and passing on many of the canals. The build up of traffic in an enclosed area is detrimental to all forms of transportation along the canals. The lack of fluid movement on the canals can hinder the movement of emergency vehicles that need to travel fast.

Figure 36: Gondola traffic off of the Grand Canal

5.1.3. Moto Ondoso

Canal wall deterioration is catalyzed by boat wakes. The waves slowly erode the walls and the mortar which binds them. This compromises the structural integrity of the walls so they are more susceptible to the destructive forces of boat wakes.

After World War II, the population of motorized boats in the canals of Venice increased rapidly. Before motorboats were introduced into the canal system, the canal walls were only subjected to the forces of water as it flowed in and out of the lagoon with the tides. Because motorboats have since become the primary mode of transportation in the city, the canal walls have been exposed to the constant friction caused by boat wakes.

When a boat moves through an area it first displaces the water by pushing it away from the boat. Then, as it leaves the same area, a gap in the water is left which is quickly filled in by gravity's effect on the surrounding water. This disturbance creates a wake, which can be devastatingly erosive to nearby structures. In general, this is not a problem because the energy can disperse in large bodies of water. In the canals, however, where the width and depth is severely limited, this poses much more of a problem when the energy from the wakes is transferred into the canal walls.

Figure 37: *Moto Ondoso* created by cargo boats

5.1.4. The Consorzio Trasportatori Veneziani Riuniti (CTVR)

Formed in the year 2000, the Consorzio Transportatori Veneziani Riuniti (CTVR) is the company that sponsored the 2001 Cargo IQP on its study and analysis of the cargo transportation system in Venice. The CTVR represents a large portion (110) of the 385 total boat licenses represented in Venetian cargo transportation system. The CTVR is very important because it has given unity to individuals in the cargo transportation system by creating strength in numbers and acting similar to that of a worker's union. The CTVR's role in the future concerning the new warehouse is a prevalent one[82].

Luigino Vianello, who is a member and past president of the CTVR and also a local cargo boat driver, has been involved with many of the changes to the cargo transportation system. During a conversation with our group, he expressed that although there is hope for implementation of a new and improved system, some of the workers are skeptical about the specific changes.

[82] ibid.

5.1.5. Working Conditions and Safety of Boat Drivers

Another important aspect of the cargo transportation activity that needs to be taken into account when studying the reengineering of this system is the poor working conditions under which the boat drivers must toil. Since potential changes to the current situation in essence depend on their approval, it is very important to address their main concerns and dissatisfactions.

Another issue of concern, as pointed out by the boat drivers themselves when interviewed by the 2001 IQP team, is the safety at the docking area at *Scalo Fluviale*[83]. For example, the signs that require all workers to wear hard hats are completely ignored, while large cargo is moved overhead by the several cranes that are located along the loading platform. Those cranes are used to move heavier cargo onto boats, including propane tanks, lumber, and large bundles of metal rods used in construction.

Figure 38: Heavy cargo being loaded by cranes on the loading area of Scalo Fluviale

Another safety concern for cargo workers is the condition of the docks in Venice. While some of the Venetian docks are well maintained, others are completely unusable. The 2007 Urban Maintenance IQP conducted surveys to assess the condition of the docks. The study concluded that 68% of the docks were usable, 23% had difficult ratings and the remaining 9% had critical flaws that prevented deliveries there.

[83] ibid.

Figure 39: Many of the docks in Venice are unusable

However, safety issues are not the only ominous aspect of their job. The absence of an overall administration, managing all the cargo operations in Venice generates a hostile environment among these boat drivers who must constantly battle for their clients. All this competition makes the idea of taking vacations or even having a "sick-day" entirely incogitable. Such stressful circumstances, nonetheless, could easily be avoided, provided that their tasks were equally (or proportionally) distributed among the shareholders of this hypothetical consortium, whose profits could then be divided among (and therefore assured to) each of them[84].

[84] Fabio Carrera, "Trasporto e Distribuzione Di Merci Nel Centro Storico Di Venezia: Spontaneismo e Riorganizzazione," *Insula Quaderni*, no. 12 (August 2002, 2002), 29-33.

5.2. Methodology

This project was designed to research and describe the current status and future plans for the Venetian cargo transportation system. The project also involved planning for future implementations and improvements to this system based upon results from our analysis. The first step taken towards achieving this goal was to obtain a complete overview of the present situation. Our group's discussions, data gathering, and analysis allowed us to add our perspective and recommendations to the preexisting proposals.

The following objectives were established in order to satisfy our requirements:

i. Assess the system implementation, determine needs for implementation, and identify problems that have arisen
ii. Research and devise possible efficiency, flow, and quality improvements on:
    a) Warehouse management and operations
    b) Distribution
    c) Loading and unloading
    d) Overall product acquisition
iii. Identify effects that politics and shareholders have on system implementation

The past studies pertaining to cargo transportation have focused on the *Centro Storico* of Venice. The *Centro Storico* faces the most urgent cargo transportation problem, and the most severe *moto ondoso* damage. Therefore, we concentrated our work to this particular area.

Figure 40: Historic Center of Venice (Google Maps)

Most of our observations of the cargo-related measurements and data collections had to be done in the early morning, when the boat-drivers are usually delivering their products. It was also important to evaluate its effects during the rest of the day, when significant traffic from other sources, such as taxis and personal boats, influenced cargo transportation. Cargo transportation, like the majority of activities in Venice, is greatly affected by tourism and this was taken into account in our observations. It is very probable that there is discrepancy between fall and winter results and those that we would find during the high tourist season. However, it is still possible to estimate and account for the considerable differences between high and low tourist volumes, enabling our studies and conclusions to be generalized, and applied throughout the year.

The following sections will address the methods and results of proposed objectives.

5.2.1. Assessing the system implementation

The Cargo Transportation project dealt with the comprehensive evaluation of the current implementation of a series of projects and proposals that attempted to provide new methods to re-engineer the system responsible for the delivery of commercial products to the islands of the historic center of Venice.

Many different studies have been conducted with the objective of solving the numerous problems related to the transportation of cargo on the canals and improving the efficiency of this system. While there has been some effort from the local authorities to develop several of these ideas, limited progress has been made to redesign and consolidate information and knowledge. A comprehensive and overall report on the issue has not yet been published. Our project intended to approach this subject from a broad, outside perspective. It sought to develop materials suitable to inform a broad audience about the problems of cargo transportation and motivate the efforts to the re-engineering of the Venetian cargo transportation system.

We began by analyzing the past Interactive Qualifying Projects that dealt with cargo. Some of these projects are: *Reengineering the Venetian Cargo Transportation System*[85], *Optimization of Cargo Boat Deliveries Through the Inner Canals of Venice*[86], *Monitoring and Analysis of the Cargo Delivery*[87], and *The Moto Ondoso Index: Assessing the Effects of Boat Traffic in the Canals of Venice*[88]. These projects provided us with a comprehensive and detailed background and baseline start for our work with cargo transportation. These four projects provide a wealth of information on their topic area which was very useful as background and subject material for our own research. Our focus on these four

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[85] Tucker and others, *Re-Engineering the City of Venice's Cargo System for the Consorzio Trasportatori Veneziani Riuniti.*

[86] Amlaw and others, *Optimization of Cargo Boat Deliveries through the Inner Canals of Venice*

[87] Stefano Ceriana and others, *Monitoring and Analysis of the Cargo Delivery* (Worcester, MA: Worcester Polytechnic Institute,[1998]).

[88] Emily Elizabeth Nodine, Anand Devanahalli Jagannath and David Chiu, "Moto Ondoso Index -- Assessing the Effects of Boat Traffic in the Canals of Venice." (2002).

projects during our study and preparation period at WPI enabled us to arrive in Venice completely aware of the conclusions and results of the previous IQPs.

One of our biggest challenges was to make an assessment of the current status of the new structure for the transportation system. We investigated the past work of the Venice Project Center and compiled information on the sponsors and other organizations related to the previous projects. This enabled us to interview a few of the people associated with the project and gave us valuable insight into the present situation of the cargo transportation system re-engineering. It also provided our group with a more comprehensive idea of the work that has been done in this area. We were then able to identify the differences and similarities between what has been proposed and what has been actually adopted.

As an example, we know that the project for the warehouse on the island of Tronchetto is under way. However, we found that it is actually being built on a different location than the suggested one. We began by exploring Tronchetto in order to find the actual location of the new warehouse being built. Using past maps and anecdotal information on the warehouse, we were able to find the warehouse construction site and photograph current progress (see figure 41). These photos are the first available of the new *Interscambio* on Tronchetto and have been made available through our group's Socioeconomic Archive. They show that the warehouse is being constructed and is even larger than the original plans outlined. The site has been excavated and the foundation concrete has been poured. The frame is being welded and constructed.

Figure 41: Construction site of the new warehouse in Tronchetto

This report details how the warehouse will be administered. It was suggested that the municipality should be in charge of it, providing reliable and impartial services to all cargo boat owners and preventing the formation of cartels and monopolies. The administration of the warehouse will be a combination of boat drivers, owners, and government. This information was obtained through an interview with Arch. Manuelle Medoro. He is currently the manager of all water boat traffic in Venice and is the official overseeing the construction of the new warehouse and docks for the cargo transportation system. He provided our group with valuable insight into the plans for not only the warehouse but also the plans for its management and operations. He provided the blueprints and

designs being used by the company building the warehouse and those that Insula S.p.A. will be using for the construction of the new docks and cargo boat garage. We also researched the economic statistics on the project such as the price that Venice will be paying for the warehouse upon completion.

We have documented many changes to the initial plans for construction and implementation. These chances resulted from obstacles that were unforeseen during the research phase of the redesign plan. These changes represent the new needs for the full utilization of the new cargo transportation system.

5.2.2. Devising efficiency, flow and quality improvements

The collection of projects and ideas that compose the overall concept of re-engineering the Venetian Cargo Transportation system separately addresses each of the main steps of the process that brings the goods all the way from the manufacturer to the consumer. In analyzing the outcomes and impacts of the overall project, we decided to break it down into a number of different parts, which can receive a more individual attention, and whose state of implementation can be more easily assessed.

Our group used this approach to add our own perspective and insight to the projects and proposals dealing with the Venetian freight transportation system. By dividing the system according to the physical course of goods being delivered to their final destination, we were able to find out where the system works and where it needs improvement. The cargo delivery path was divided as follows:

- Upstream product acquisition
- Warehouse management and operations
- Loading
- Distribution
- Unloading
- Secondary distribution (docks to the stores)

The upstream product acquisition deals with the purchase of the products from the distributors, located on the mainland, and the transportation of such products into the city of Venice. Venice, because of tourism, has a constantly increasing demand for basic needs which is fulfilled by a series of different suppliers, which sell their own merchandise to a certain number of clients among the Venetian economic establishments. Similar orders of different stores may be filled from two different sources. A better method might be to combine it into one larger order from the same wholesaler. As an example, if all the Italian restaurants on the Venetian islands decided to buy tomatoes from the same distributor, significant discounts could be obtained, and fewer trucks would have to be coming into the *Tronchetto* area loaded with tomatoes. This would reduce the traffic, and facilitate the separation and loading of the boats.

The construction of a general cargo warehouse was proposed in 2001 by the IQP group responsible for the project entitled *Re-Engineering the City of Venice's Cargo System for the Consorzio*

Trasportatori Veneziani Riuniti[89]. Their idea was to have it built on the *Tronchetto* island (where all the motor vehicles that arrive in Venice must park), and its basic purpose would be to centralize the operations between trucks and boats (as a distribution center) and to facilitate the sorting of the products and the loading of the boats, according to their *destination zone*. We first evaluated the current status of the warehouse construction and found out what changes have been made to the original plan. We also documented the problems – both bureaucratic and logistical – that have been faced on the course of the project's implementation. Our group also explored the administrative problems that may eventually arise, once the warehouse is actually constructed. Deciding who will be responsible for daily operations and management is crucial to the success of the new system and it is crucial that its activities and operations are not influenced by interests other than those of the city.

The product distribution is comprised of the actual cargo transportation on boats through the Venetian canals. The main concerns are the social, infrastructure, and economic impacts that the excessive traffic on the canals provokes, and the fact that freight transport is responsible for a significant portion of the overall boat circulation. This means that a reduction of the number of trips required to deliver goods could alleviate some of the main problems associated with distribution. We have found that this would be done most efficiently by organizing a system that focuses on delivery *by destination*, rather than *by product* (depicted on Figure 42), as suggested by a 1997 IQP group, which requires the conclusion of the warehouse and also the formation of a comprising consortium among the cargo boat drivers[90].

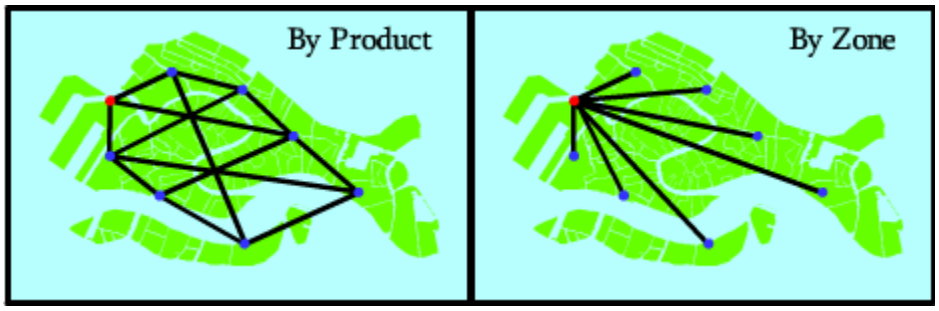

Figure 42: Distribution by Product vs. Distribution by Zone

The final step consists of unloading merchandise out of the boats and then transporting it to final destinations – a store, storage room, or restaurant. The problems with this step lie with poor conditions of the docks, transport by the boatmen from the dock and into the establishment, which is not necessarily close to the dock area, and crowding of unloading areas and streets. This slows down the delivery processes, reducing their efficiency, and increases the parking time of boats, which, on inner (and therefore narrower) canals, can create a bottleneck. Our group analyzed the current problems on and around the Venetian docks and then devised viable solutions for the city in order to alleviate these conditions.

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[89] Tucker and others, *Re-Engineering the City of Venice's Cargo System for the Consorzio Trasportatori Veneziani Riuniti.*

[90] Amlaw and others, *Optimization of Cargo Boat Deliveries through the Inner Canals of Venice*

Figure 43: Boat docked along algae-covered stairs and a fenced in wall, making delivery difficult

In order to study and devise the quality improvements to the cargo transportation system, it is also important to analyze which external factors may influence in the elaboration and implementation of new plans. Politics and stakeholders may affect that in essentially two ways: during the process of finalizing ideas, when bureaucratic barriers are imposed by public organizations and by interested parties, and when negligence from authorities slows the process. Once the system has been designed and is ready for implementation, decisions have to be made regarding the management of the new implemented structure. In the latter case, a private versus a public administration present their pros and cons, and will be analyzed, so that the whole system is not risked due to biased jurisdiction.

Our group obtained the current plans and determined what parties are currently responsible for the system implementation (such as the construction of the warehouse) and how the Venetian authorities are involved in these operations. Also, by interviewing the people officially responsible for the carrying out of these operations, we gained insight into the political scenario behind them, allowing our group to be able to better propose new ideas, so as to minimize the undesired political influences on the implemented system and increase its usefulness.

Finally, our group decided that in addition to our original goals and objectives, we wanted to go beyond the scope of researching and expressing the current status and future plans for the Venetian cargo transportation system. This was accomplished by designing an application that will make a lasting influence on the new cargo transportation system and serve as a prototype for not only further IQP projects, but for advanced modeling solution companies such as Redfish, and also for those involved with the further implementation of the new cargo warehouse and system.

This application is targeted at the cargo boat drivers and people involved with delivery, and if implemented would be able to increase their efficiency and simplify their daily deliveries. The first premise was to make a software program that would enable boatmen to be able to find which bridges are impassable due to *acqua alta* on a daily basis. This evolved into a program that does not only that but also takes into account which docks will be inaccessible and the height of the boat as well. At any given time it can tell the user the overall percentage of accessible bridges in the city as well. It will use a screen scraping program to be able to find the daily tidal information. The final goal of the program is to be able to plot the most efficient delivery path daily for cargo pilots and be expandable to take other factors such as construction and traffic into account.

The initial prototype of the actual application platform was developed using a combination of Macromedia Flash, MapInfo and standard html coding. It is based on the MapGIS layers of Venice and includes every bridge in *Centro Storico*. However, originally the layer was missing about twenty bridges' information. The Urban Maintenance group was helpful in providing us with measurements for a number of the missing bridges. The rest we found by measuring the heights from the water to the apex of the parabola (taking tidal information into account) and inputted this data into our program database.

While this application is not fully functional in the plotting of actual delivery paths, it exemplifies the usefulness of WPI IQP data in providing real time solutions to the city of Venice and is already a useful tool for finding impassable bridges. It also serves as a model for future development of similar programs and applications by both IQP groups and outside contractors and companies and shows the viability of similar ideas from students. If this prototype is developed further or another is created using this design as a model, it could easily revolutionize the way cargo boat drivers deal with adverse conditions of canals and streamline the delivery process.

5.3. Results and Discussion

Due to the nature of our objectives related to the cargo transportation system, our results basically consisted in an overall analysis of the current system, which yielded our cargo book chapter, and in a series of suggestions for improvements. In this sense, we thought it would be wiser to present our results by combining the *Assessment of the System Implementation* and the *Devising of Improvements* in one section that describes each of the main problems of the current system, followed by our devised method for improvement.

5.3.1. Loading Problems

The first observed problem in the cargo transportation system is the process of distribution of the pallets at the loading docks. Our group found an inefficient loading procedure for the pallets. Currently, to get the cargo into the boats workers often toss boxes across the water and boats and the only form of organization are the printed manifests detailing what cargo a boat should have on it. As described previously in the IQP report, it is noted that there is insufficient space for loading. Often boats must align in a parallel row of six at one docking location in order to receive their cargo. As a result of these pallets and boxes must move across several boats to get to the boat in which they will be transported. The new docking system currently suggested, but not yet implemented, allows each boat to have its own docking port. This will speed up the loading time for the cargo transportation workers, promote team work, increase safety and improve working conditions. After the implementation of this system it will be important to perform a statistical analysis, including time-motion studies, of the amount of time saved with a new loading time.

Another analysis that will demonstrate the importance of this new system is a safety study. In order for a comparison to be made a current calculation of safety needs to be documented. This factor of safety can then be compared to the safety factor of the new system. A proposed future project will compare the old docking system to the newly proposed one. The degree of safety, a comparison of time reduction, an analysis of the re-organization, and the overall efficiency levels can all be calculated. This information can be easily represented by the use of graphs and statistical data in order to support the current belief that a new system is more beneficial. Currently the group believes that the new system will be more favorable, but it would be helpful to have concrete evidence.

Table 12: Evaluation table of cargo transportation systems

	Degree of Safety	Degree of organization	Allotted loading time	Overall efficiency level	Degree of time reduction
Current system					
Proposed system					
Implemented system					

5.3.2. Distribution of goods among boats

Another problem lies with the distribution of goods among boats. The basic issue is the fact that *Scalo Fluviale*, and therefore the general cargo transportation system, is run on a first come first serve basis. Therefore, there is no organization in the distribution of goods among different boats and different companies.

A proposed solution is to unite all the cargo drivers under one management. If the cargo drivers were united under one management there would be established standard levels of pay based on work done. An advantage resulting from this new management would be the removal of competition between different companies. Another advantage would be to eliminate unnecessary trips of half filled cargo boats. It is very ineffective for a larger cargo boat to be making trips half full with cargo boxes when a smaller boat could do the same job faster and with fewer costs. Maximization of boat loading and percentage of cargo space used would result in fewer trips and less traffic, noise, and pollution.

A selection process needs to be established in order to determine who, among the current cargo companies, will be in charge of overlooking the cargo transportation system. After this company has been selected ranges of pay must be determined based on fleet size, boat quality, condition and capacity, and worker experience. Under new management drivers will fall under a blanket group and unification that in the long run would produce a stockholder system. The city will guarantee a certain level of service, by having members follow certain rules and regulations.

5.3.3. Distribution Models

When studying the Venetian cargo transportation system, one of the most important topics of discussion is the distribution method that should be followed by the cargo boats. The choice of a better distribution method largely influences the overall efficiency of the system, and therefore this topic deserves considerable attention from authorities and the boat drivers.

Currently, each boat driver or boat company sets a contract with one distributer, being responsible for the merchandise brought to Venice on only one truck. Even though, this facilitates the unloading from the trucks and the loading onto the boats, it in turn makes the distribution to the islands more complicated. The problem lies on the fact that each boat receives few types of products (those that come from the same distributer) and has to make deliveries to all stores and restaurants in Venice that ordered such products. In other words, if one store on every Venetian island orders tomatoes from the same distributer, the boat that responsible for the transportation will have more than a hundred stops in one day! The inefficiency of this method is very clear: it largely contributes to the increase of traffic on the canals and generates more costs and more work time for the cargo boat drivers.

A very interesting proposal for improvement came from the 1997 Cargo IQP team. They realized that a system in which almost a hundred boats have to make stops on a single island (*San Luca*) has to be re-engineered. For them the delivery model should change from "by product" as it is currently done, to "by destination". The basic idea would be to sort the products before they are loaded onto the boats, according to their destinations. This way, each boat would be in charge of making all the deliveries to a set of destinations, rather than being in charge for all the deliveries of a set of products.

In 2001, a new cargo IQP group was formed, with the mission of studying the feasibility of the delivery by destination. Their research, sponsored by the *CTVR*, ended up improving the concept of delivery by destination to delivery by zone. Their proposal was to have the 125 islands of the *Centro Storico* of Venice divided among 16 zones, according to the usual cargo demand from each of the islands. A general cargo warehouse was also part of the plan. There all the cargo, coming from different distributers, would be resorted by destination zone. Also, a fleet containing dry and refrigerated boats of various sizes would then be assigned to making all the deliveries to each of these zones. The 2001 Cargo IQP team concluded that these transformations could reduce the number of deliveries to a single island on a day by up to 90%, which would significantly benefit the traffic on the canals.

Even though the efficiency and viability of the delivery by zone was thoroughly studied and documented by this group, the current belief is that an even more sophisticated distribution method can be implemented, based on the same concepts, and with even better efficiency ratings. The main reason for still another distribution method arises from the fact that the cargo demand per island, used by 2001 Cargo IQP to define the delivery zones, experiences considerable changes everyday. Therefore, the fixed delivery zones, which could be very useful on a given day, could also result on a whole fleet of boats having no work to do (or an excessive amount of it) on another day. Due to this fact, a dynamically changeable system is being studied, as a way to readapt the distribution system on a daily basis, optimizing the use of the cargo fleet.

The new idea relies on the extensive use of technology and computers to define, on the beginning of every day, the itinerary of every general cargo boat. The most recent analyses and

conclusions suggest that the current cargo fleet would be divided, not according to delivery zones, but according to *modifiable delivery routes*. Several of these routes would be created and a fixed number of boats would be assigned to each of them. However, these routes would be redefined every day, based on the demand of the islands.

This distribution model was devised based on a delivery system for cargo planes in the US, invented by the American group Redfish, specialized in applying complex adaptive systems to business solutions. Their algorithm finds the best routes for packages to arrive to their destination using multiple carriers, taking into consideration the different fees charged by each carrier and the different flight durations. In a way, this is an extension of the "travel salesman" problem, making use of advanced computer programs to find the most efficient route that still makes all necessary stops. The difference is the existence of multiple travel salesmen that cooperate, or in the cargo planes case, multiple carriers, or yet, in the Venetian case, multiple cargo boats that cooperate.

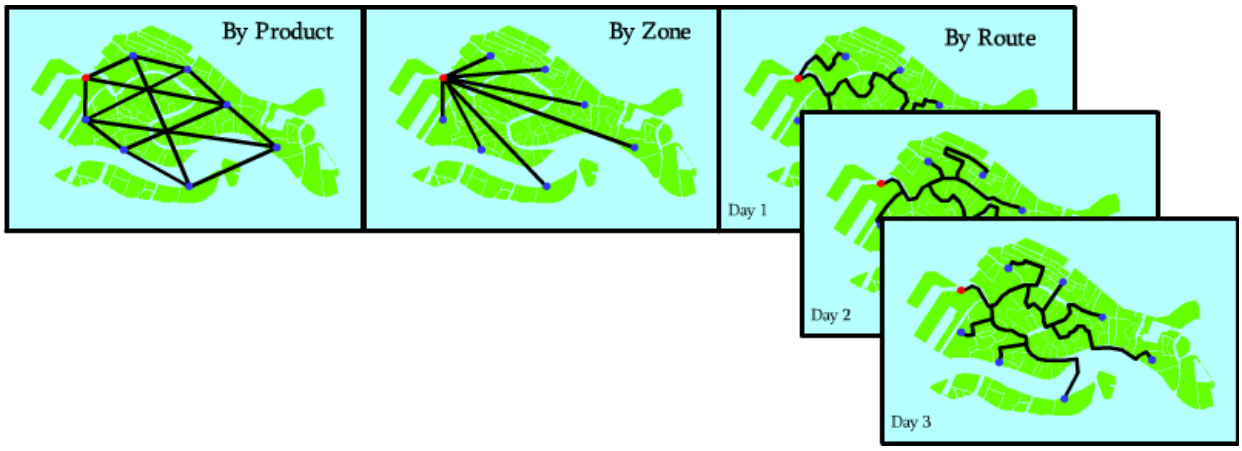

Figure 44: The different distribution models

5.3.4. Illegal licenses

Currently loopholes allow illegal cargo boats to deliver products to the Venetian islands. Approximately 40 cargo boats find themselves in that situation. These transporters are licensed in order to transport from other cities (on the mainland, or on the other islands in the estuary) to Venice but are actually transporting illegally within Venice. By doing that, they generate extra competition for the licensed Venetian boats.

Control of this situation is extremely important to avoid profit to be taken away from the legal boat owners. The group suggests the implementation of better enforcement including:

1. Periodical cargo checks by local police
2. A company that manages and polices the distribution of cargo at the loading docks
3. A clear identifier on the boat displaying their transportation license
4. Heavy fines for illegal boat traffickers

5.3.5. The New Warehouse

Another focus of our studies for the Cargo part of this project was the newly designed warehouse where the boat loading will occur. In order for a change in the distribution method to take place, a central warehouse must be constructed, as a location for the unloading of trucks, the storage of goods, the sorting of goods and the loading of boats.

Initiated this year (2007), the construction of the warehouse (*Centro Logistico* or *Interscambio*) is happening at the Tronchetto area. The location is not the same one suggested by the 2001 IQP group, but it is on the same island, as it can be seen on Figure 45. The city will purchase the warehouse as an empty foundation box with front docks for the loading of the boats. The costs of the construction will be covered by the 30 million Euros that will be funded by the city for the project. Most of this cost was incurred because the waters were too shallow and had to be dredged and the sediment needed correct removal. Another problem that was faced during construction was the underground pipes that had to be avoided by means of the new construction site being built over them. The construction is being carried out by a private company, who has received one third of the 30 million Euro budget, and will receive the rest of it if the warehouse is completed according to the schedule, in July 2008. To complement the role of the warehouse, Insula S.p.A. will be constructing an overnight docking area for the cargo transportation boats, also located on the Tronchetto area. This will hopefully accelerate and help the organization of the operations of cargo loading. The incurred costs for this docking area are currently estimated between 7.5 and 10 million Euros.

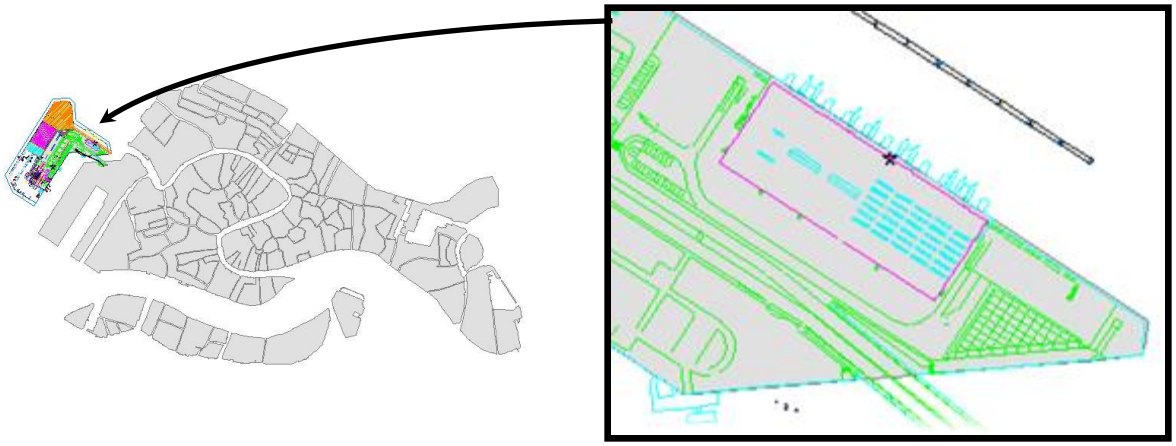

Figure 45: Blueprints of the *Interscambio* warehouse currently in construction

Manuelle Medoro, manager of the water boat traffic in Venice, is currently the government official overseeing the construction of the new warehouse. According to him, the warehouse will be extremely beneficial to the current cargo workers by providing them with a safe work environment, and by allowing them to better organize themselves. The cooperation among boat drivers can lead to quicker delivery times, an efficiency increase by using correctly sized boats, and the possibility of a division of profits, which in turn increases job security and allows boat drivers to take vacations and sick days without the fear of losing their clients.

Although the implementation of a new plan for the cargo transportation system is still in the future, it is known how the city will lease out the storage space. The *Comune* in actuality will own the warehouse but they have a plan of action to rent it to the licensed Venetian cargo boatmen so that they will have the opportunity to unify their efforts under one roof and hopefully one system. The current idea mentioned by Medoro is that the city, once having purchased the completed building, will devise means to regulate its use. The idea is to put the ownership of the warehouse up for bid. Only licensed transporters will be able to bid on the ownership (in means of renting the building for use) of the warehouse. Since coalitions are expected to be formed for the bidding process, it is a way to try to assemble the cargo transportation drivers into a common group, without much government involvement.

5.4. Proposals

Besides the recommendations presented in the previous section, our group also came up with a few suggestions for future projects. They arose from our observations on the current cargo transportation system and from our discussions about how to solve the current problems and how to improve the current operations.

5.4.1. Delivery by route application mockup

In order for the delivery by route idea to be implemented, powerful computer software must be created, allowing the boat drivers to receive their daily itinerary of deliveries. An important tool that would help this process to become functional and also serve as an argument to convince the boat drivers of the benefits of this system would be a computer application that provides a visual demonstration of the daily routes on any given day, according to the cargo demand by island.

Even though our group does not have the necessary knowledge to implement such application, nor do we have access to the information that would allow it to be accurate, we were able to make a mockup of it. This can be used as a suggestion for the actual application and as a tool to advertise the idea of delivery by routes. The "functional" mockup is in the CD that accompanies this project report.

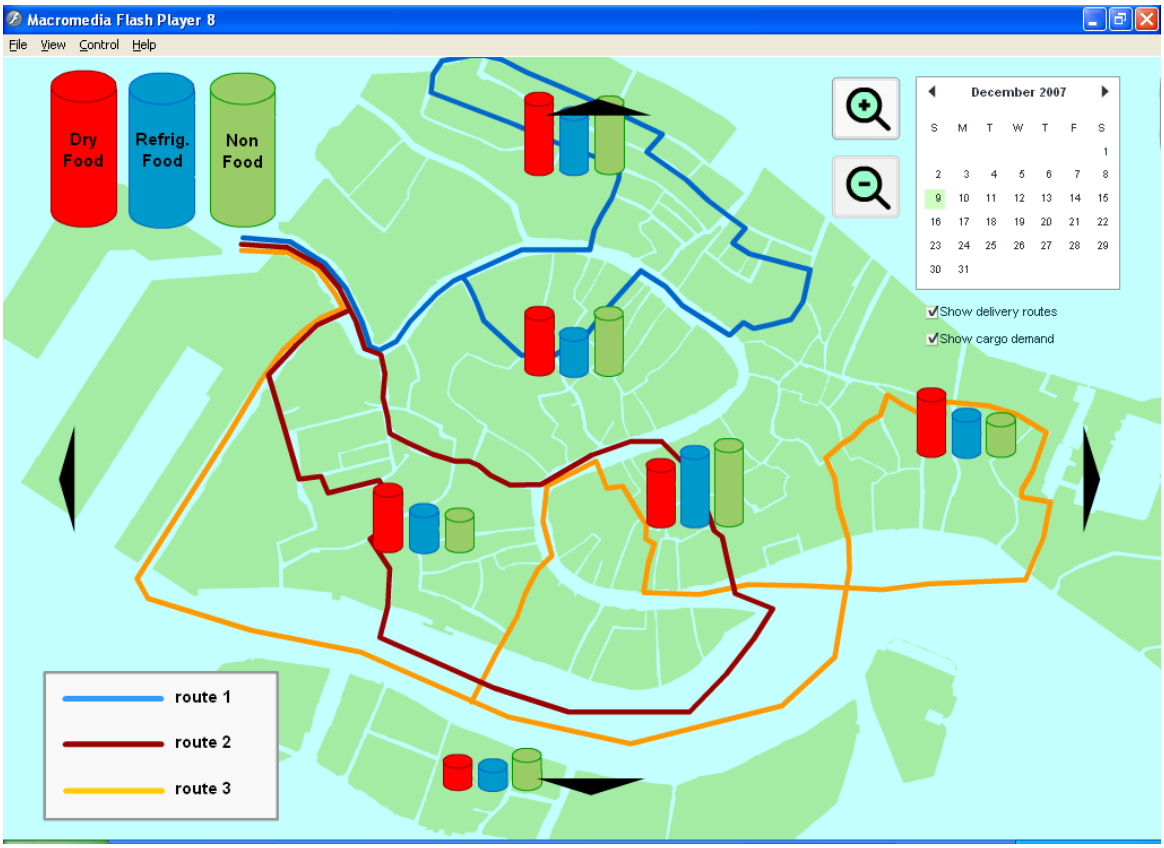

Figure 46: Mockup of Delivery by Route application

5.4.2. Influence of tides on cargo delivery routes

Currently in Venice, there are many problems that arise due to natural phenomena. During a high tide situation the clearance underneath the bridges decreases and causes the passageways to become difficult to navigate. This presents a problem for cargo transportation drivers as well as anyone navigating the canals by boat. It is often difficult to know before hand which bridges are impassable due to these high tides. Our group has created a functional prototype software application which allows the cargo drivers to access information about passable and impassable bridges. This program takes into account the level of the water, the clearance under the bridge, and allows the user to input the height of their boat and any cargo it may have aboard and can show the user which bridges are passable and impassable as well as the total percentage of bridges that are accessible.

Figure 47: Screenshot of the Bridges and Tides application showing its capabilities in identifying passable and impassable bridges when tidal height is 63 cm and in a boat of 150cm. Passable bridges are highlighted in green whereas impassable are red.

Our group has also created a model for what the future of this application may hold. Using all the information in conjunction with a map of the city and canals, the program will be able to determine the best route of travel. The intent is that the program will be instituted in such a way that the cargo drivers can have daily updates on the best routes to take for their delivery and plan accordingly. The information about the tides will be generated using a program that extracts the information about the heights off the weather page. This information will automatically update the route system, and those bridges that are determined to be unusable will be shown in red on the map. The program also allows the cargo drivers to enter the height of their cargo to obtain the best route. Information on the

condition of Venetian docks and which are accessible is already available and will hopefully be incorporated in the future as well.

Figure 48: Another screenshot of the Acqua Alta Application, showing its planned future capabilities of mapping out the best routes based on tidal and boat information

5.4.3. Impact on canal walls

Another concern identified by the current IQP group arose from the observation of cargo transportation on some of the inner canals, more specifically on intersection points. While watching the deliveries, we noticed that sometimes the cargo boats hit the canal walls while trying to turn. This impact by the cargo boat is detrimental to the structural architecture of the historical buildings. The direct impact made with the wall deteriorates and imposes stress on the structure. The group feels that a system to protect the walls should be implemented. For future students, a practical IQP would be creating a safety guard to put on the wall or the boat itself to reduce damage of the impact. The future students can develop a model to demonstrate the damage the boat creates.

5.4.4. Opinion of the Cargo workers

Once the new warehouse construction is finished, a general management will have to be responsible for overseeing all its activities. This is necessary in order for any other changes to the cargo transportation system to take place.

During this process, political problems may arise and the opinions of the cargo boat drivers need to be addressed. The probability of success for this new implementation will increase if the cargo drivers accept the program and are satisfied with the changes. The group suggests a future IQP investigation involving all parties concerned with cargo transportation improvements. This would involve sitting down with a large percentage of the current cargo force to obtain their ideas and opinions for implementation of this new system as it is important to know what changes the cargo drivers would like to see implemented. After these suggestions have been analyzed a second meeting with these parties would be beneficial. During this meeting the group would need to discuss the ideas that the cargo drivers came up with and demonstrate how these ideas can actually be used and suggest improvements upon them in order to create a system optimal for everyone. The proposed changes will not work unless they are agreed upon by the drivers. Implementation of new rules and methods is an iterative process and everyone should understand that continual improvement is possible and necessary.

6. General Conclusions

Other recommendations dealing with tourism and retail can be seen in the conclusionary graphics of our presentation but cannot be included here because of their animation. Every year out of the 14.6 million tourists in Venice, 11 million of those tourists are excursionist tourists. An interesting fact about this statistic is that out of the 11 million excursionist tourists, 5.7 million of these excursionists are improper excursionists[91]. This means that they find lodging on the mainland or other nearby islands and commute every day as tourists to save money on lodging. If there were a way to lower lodging prices in *Centro Storico* or at least make them comparable, whether through government incentives or other means, it would be possible to convert these 5.7 million improper excursionists into residential tourists. These residential tourists actually stimulate Venetian economy and actually balance the costs incurred on the city through tourism, unlike excursionists who put little money into Venice, but incur large costs. The average excursionist spends about €40 whereas the average residential tourist spends about €180[92]. If the 5.7 million improper excursionists became residential tourists, Venice's tourism related income would actually increase from €1.097 billion to €1.914 billion. That is a 74% increase. Another idea to discourage excursionist tourism is the introduction of landing and/or entrance fees for the city. Landing fees are already customary in almost any major city and are actually already included in ticket prices for some of the planes, trains, buses and boats in Venice. However, this money does not currently go to Venice. Venice needs to introduce a percentage fee on every transportation ticket to the city. This will not only discourage day tripping, but pay for some of the costs related to tourism. The idea of the entrance fee is that a tourist planning on staying in Venice for an extended period of time expects to pay money, however excursionists staying only for the day would be less likely to want to pay a fee to enter.

Over the years, as the number of non-food store openings has increased and the number of food store openings has decreased, Venetian comfort level has decreased as it becomes more and more difficult to obtain one's daily necessities. In order to cope with this trend our group proposes that the municipality puts a cap on the number of non-food store openings. As space becomes available food stores would be able to open in that space. Because there has been a decline in traditional food stores, in order to fill those spaces, our group also believes that distributed supermarkets could pose a solution for this problem. The idea is that a company could come into an area that had a previous grouping of food stores such as a butcher, baker, and grocer and reopen those same stores but under one management and purchase system. This would not only increase comfort level for residents but also bring back much of the social and historical significance of these market places.

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[91] Durigan and others, *Turismo a Venezia: Trend, Statistiche, Dati e Indirizzi 2005*
[92] Ibid.

7. Deliverables

During the course of our studies, it was important to realize that future projects and IQPs will utilize and expand our conclusions and discoveries during their own research. For future students it is important to provide easy access to all materials we have produced. It is also advantageous to allow our methods and results to be available to the public.

One of the main accomplishments of the 2007 Venice IQP was producing written material for the book *Venice 2.0*. To commemorate the 20th anniversary of the Venice Project Center, the book will be published in the coming year. Our objective was to research all the previous projects that pertained to the broad category of Socioeconomics, encompassing as many topics as possible in a collection of book chapters. We decided to write three chapters: *The Cargo Transportation in Venice*, *The Venetian Retail Sector* and *The Impacts of Tourism on the Venetian Society*. These chapters present the reader with a thorough description of each of these socioeconomic issues, including a background of the current problems, the current scenario, and the future plans to solve the social and economic problems faced by the city of Venice. Our texts are mostly intended for people who have a familiarity with Venice and its problems, and especially the Venice IQP alumni. However the chapters were written in a manner that provides anyone who does not know Italian with the opportunity to comprehend the issues that concern the Venetian society.

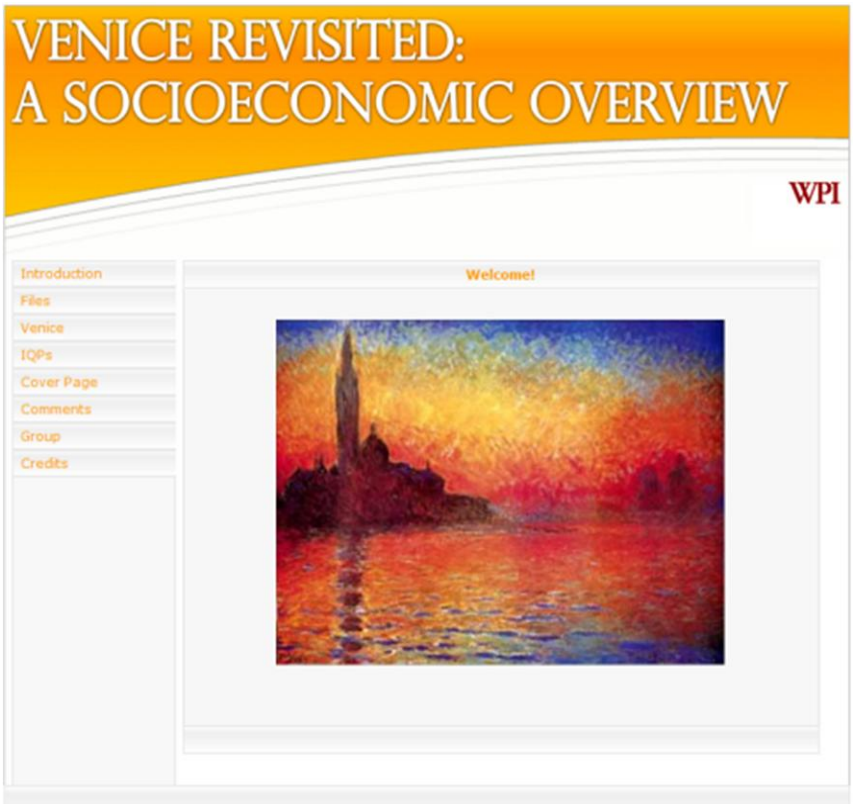

Figure 49: Socioeconomic group website

Even though most of our results, graphics, and maps were included in the book chapters, we had to find a different destination for the iconographic material, and all the multimedia that we made over the course of this project. To serve this purpose, we have been updating our website, hosted at *www.wpi.edu/~ve07soc* with the graphs and web applications that we created. This will showcase everything we did in this IQP, especially while the book is not published, and will be the main source of information on our project for future IQPs.

Thinking beyond the scope of our project, we have looked into the current lack of material in the Venice Project Center archive. At a crucial point in the history of the project center, the verge of its 20th anniversary celebration, we felt that we could contribute to its success with a deliverable that would both be very useful for the future projects and serve as a showcase for materials produced at the VPC. During our experience, we encountered many problems every time we had to search for graphic and visual material. We would have to go through several IQP reports, hoping to come across what we wanted. This was an inefficient process that hindered the projects development. To solve this problem, we created a useful tool in the form of a web application system. This application combines graphical material produced in the last 20 years of IQPs in an organized and searchable fashion. It is called the *Venice Visual Archive* and it is currently online, as a subsection of our main website. It allows anyone to upload pictures and their respective information. Our hope is that the contributions of all involved students will make this a very comprehensive archive as well as a useful graphical database for all Venice-related projects in the future.

Figure 50: Screenshots of the Venice Visual Archive

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